



P & H

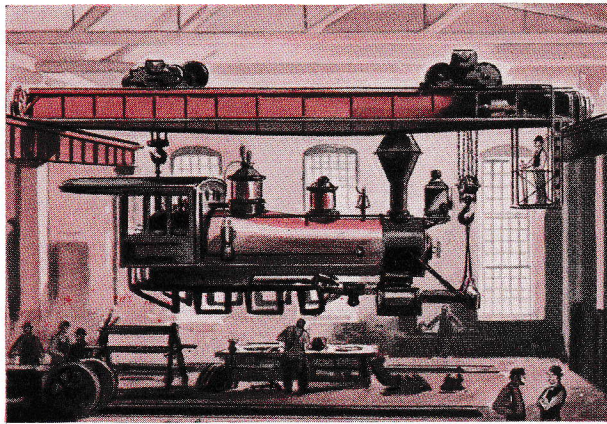
**INDUSTRIAL
CRANES**

HARNISCHFEGER CORPORATION, MILWAUKEE, WISCONSIN . . . BULLETIN C-6

MAKING AMERICA'S

A Brief Sketch of Overhead

LOOKING BACK TO THE EARLY '80'S



One of the first three-motored P&H built cranes—installed by the Union Pacific Railroad in 1890. It is still in active service.

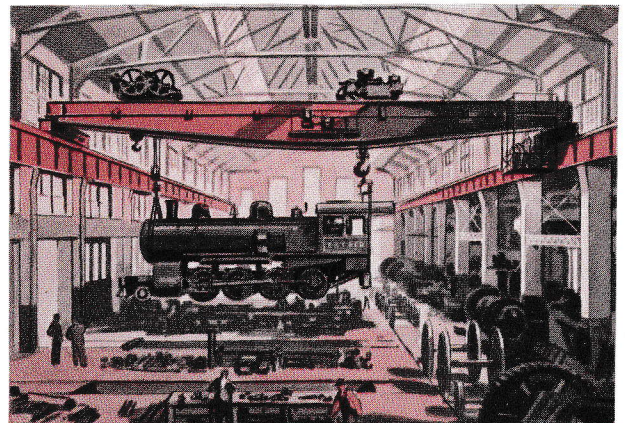
1884! Before electricity was applied, before gasoline power was employed, the country still in an agricultural era and mechanics in the cradle of development, steam power and hydraulic pressure were the prime movers. Just a generation after the Civil War and in the wake of a country-wide financial crash, two energetic young men, Alonzo Pawling and Henry Harnischfeger, experienced, but with no financial support, formed a partnership that in the next fifty years grew to a great industry. It has led the way in designing and building the equipment American industrial plants needed to move their materials.

Steam, hand, hydraulic and rope driven cranes were seeing their last days. Built in limited capacities at slow speeds, their more hazardous operation required skilled attendance. They were inadequate to meet the spreading demand for efficient material handling equipment.

MATERIAL HANDLING COMES INTO ITS OWN

America had to grow. Greater machines, heavier engines and pumps, immense steel structures, meant an ever-increasing demand for more iron, stone and steel. Railroads were thrusting their arteries into every last frontier, creating the need for improved machinery to take over the task of keeping America's products on the move.

The "new" phenomena, electricity, brought the street railway type of motor to convert and repower many old-type cranes. But the improvement in operation was slight—mainly because the various movements of hoisting, lowering and racking were accomplished through a complicated tangle of gears, clutches and shafts—driven by a single motor.

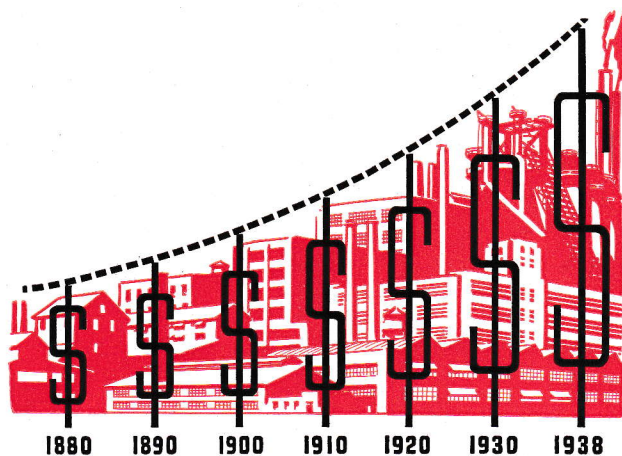


Along about 1900 this 80-ton P&H crane was delivered to the Chicago & Eastern Illinois Railroad at Danville.

THE BEGINNING OF A NEW INDUSTRIAL ERA

That was the situation in 1889 when Pawling and Harnischfeger, then the operators of a thriving machine shop and foundry business, built a crane on entirely new principles—a crane with three motors—one to run each motion—hoisting, traversing and racking—separately! It brought new production methods to all types of manufacturing plants—new methods based on faster, more efficient and safer handling of loads—all at a lower cost.

Industry welcomed the greater speeds and larger handling capacity of P&H three-motored cranes. They were immediately adopted by the material handling field and led the way into the new industrial era of the Twentieth Century.



INDUSTRIAL HISTORY

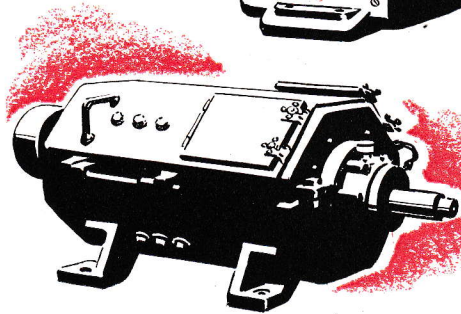
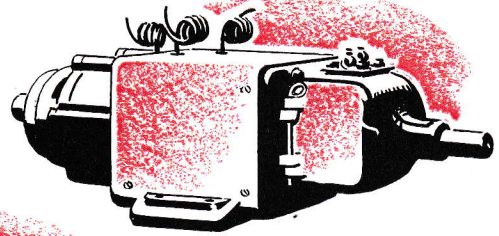
Traveling Crane Development

WHY P & H BUILDS ITS OWN ELECTRIC CRANE MOTORS

The principal shortcoming of the first multi-motor cranes was the cumbersome, series wound, reversible motor of the street railway type. These were obtainable in only few capacities—most of them too large to drive safely the traversing motions—and the delivery of any motor was at best, very uncertain.

To obtain the best motor for the job and to become independent of outside sources, Pawling and Harnischfeger established their Crane Motor Division. Here were developed the P&H slow-speed reversible and powerful series-wound crane motors, along with solenoid brakes and the dial-type controllers with wire coil rheostats. Later, when the A.C. motor-driven crane was introduced, the Harnischfeger Corporation completed its electric equipment line with the development of a full line of A.C. and D.C. motors, brakes, drum controls and panel board equipment. These economies

1890



NOW

plus the advantages of single manufacturing responsibility are still being passed along to P&H crane users.

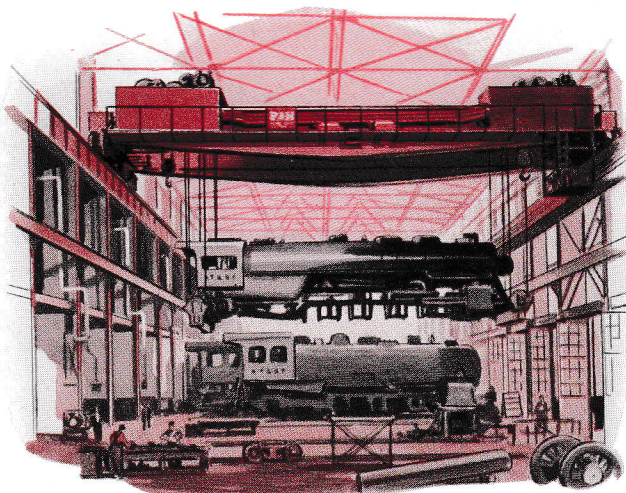
LEADERSHIP THAT HAS NEVER FALTERED

Since the days of 1890, more than 10,000 P&H cranes have left P&H shops—each one built to consistently high standards of design, material and workmanship—each one a true reflection of the attitude of “quality and service.” From the first P&H crane, whose basic design is still followed by the industry, to the 10,000th, sound engineering principles have always stamped them as leaders in the field.

Most of the major improvements in crane design—in

roller bearing trolleys, welded alloy steel trucks, and more efficient electrical equipment—have been developed by P&H trained Harnischfeger engineers, who never ceasing in their efforts to bring to industry the best in modern crane equipment, have long been considered as final authorities on questions of crane construction. Through their continuous improvements in design and performance, P&H has earned its leadership as “America’s largest builder of overhead traveling cranes.”

CRANE CRAFTSMANSHIP ... WHAT IT MEANS TO THE USER



Modern 250-Ton P&H crane owned by Santa Fe Railroad.

In any craft, much experience is needed before a product can be thoroughly proved. The 50 years of experience behind the Harnischfeger Corporation, from engineers to foremen and pattern makers, make it an organization whose skill in “crane-craft” is second to none. To the user, who is interested in reliable service, this means a product that represents the best in proved design and construction—to assure a profitable return on his investment. He may be confident that in buying a P&H crane, he is taking a step in the right direction—a step towards a more efficient method of keeping his materials “on the move.”

CRANES FOR EVERY TYPE OF OVERHEAD HANDLING WORK

THE ABILITY TO DESIGN.....



Few organizations can boast a group of men as large and well versed in the many aspects of their field as the staff of P&H crane engineers. Their background in solving thousands of material handling problems—of every size and type—provides a broad experience to meet each new problem in the most efficient manner. Yet with all the new developments they have brought to the field, they have never lost sight of fundamentals in producing cranes that are conservatively rated, and thoroughly proved in every detail of design.



THE FACILITIES TO BUILD...

The Harnischfeger Corporation not only has the facilities to produce a complete standard type crane every working day—it has also the men, the equipment and the factory space to build the largest types of overhead traveling cranes in the world! From P&H welded and flame-hardened steel gears to the load blocks on the cables, practically every unit used in P&H cranes is designed and manufactured right in the P&H shops. There is no semblance of the so-called "assembly shop" type of plant, for the Harnischfeger Corporation is a completely self-contained manufacturing unit, which relies upon outside sources for its raw materials only.

THE EXPERIENCE THAT SAVES YOU MONEY

Experience is, after all, the greatest teacher. During the past 50-odd years P&H crane engineers have met and successfully answered the demand for practically every type of overhead traveling crane. In working out your particular problem, P&H engineers, with this wealth of practical experience, will recommend the type of crane best suited to meet your specific needs. That this is recognized as a real dollars and cents value is shown by the repeat orders for P&H cranes placed by the largest and the most experienced crane users in the country.

HOW TO SELECT CRANE EQUIPMENT PROPERLY

The purchase of a crane entails much more than mere examination of specifications and securing the lowest possible price. Its consideration really begins when the building or structural plans are being drawn.

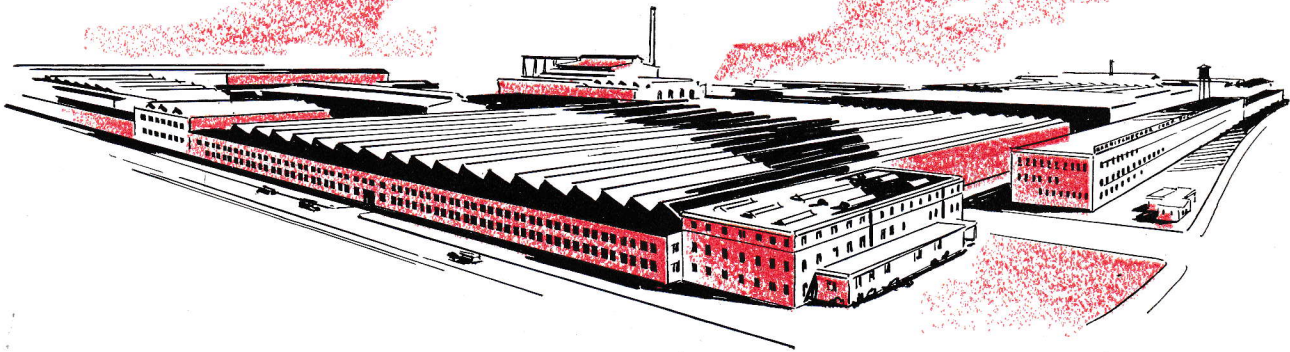
Just as the production of machinery in other fields has been standardized, so have the component parts of cranes been standardized in the P&H shops. While it is not feasible to build cranes and lay them "on the shelf," the basic design is uniform and the manufacture of parts follows this design; adaptation for different installations is but a matter of dimensions. Naturally the P&H crane user benefits from this standardized production in obtaining a better product at a lower cost.

To repeat, the purchase of a crane should begin with the plans for the building in which it is to operate. After a building is up and ready for occupancy, the owner often discovers too late that the structure is not adapted to a standard crane. Then the crane builder must adapt a crane to the structure, which means that the standardized production system of the manufacturer

must be interrupted by the construction of a special type of crane—resulting in high reproduction cost, longer delivery dates on both the crane and renewal parts. Such a condition is caused by neglecting the matter of overhead clearance in the building plans i.e., distance from top of runway rail to roof, and from center of rail to adjoining wall. A poor runway also is a possible source of trouble. The runway should be strong enough to avoid undue deflection between columns; and it should be stiff enough sidewise to take the impact coming from the sudden starting and stopping of the trolley. If the span is not absolutely uniform, there is danger of heavy wear on truck wheels, resulting in unnecessary repair bills and high power consumption.

Many costly hazards, unforeseen by the more or less inexperienced crane user, can be avoided by the early consultation of a P&H crane sales engineer. This places you under no obligation whatsoever, and will oftentimes save thousands of dollars.

THE MOST MODERN AND COMPLETE PLANT FACILITIES IN THE INDUSTRY



2000 Men and Women Working with the Latest in Modern Equipment, in Plants Covering 36 Acres

To the visitor's mind, two impressions are immediately conveyed on walking through the aisles (there are more than two miles of them) in the P&H shops. The first is that of "hugeness"—a natural reaction at the sight of bay after bay of assembly lines, machine tools, welding booths, gear cutters, automatic machines, and oftentimes as many as twelve to fifteen partly assembled cranes being prepared for shipment.

The second is an impression of "completeness" that

comes after viewing the large foundry, the modern testing laboratory, the busy crane motors division, the forging hammers, the heat-treating furnaces, the weldery, the vast areas of the structural steel warehouses and shops. Indeed, no step in the orderly process of quality manufacture has been omitted. From the machining of P&H splined shafts to the flame-hardening of P&H cut-tooth gears—P&H cranes are P&H-built throughout.

A COMPLETE FOUNDRY...



All castings used on P&H cranes are produced in the modern P&H foundry, by men who have made the study of metal molding their life's work. From here, iron, bronze, copper and aluminum castings, free from harmful inclusions, find their way into all P&H divisions—to be used for crane drums, gear housings,

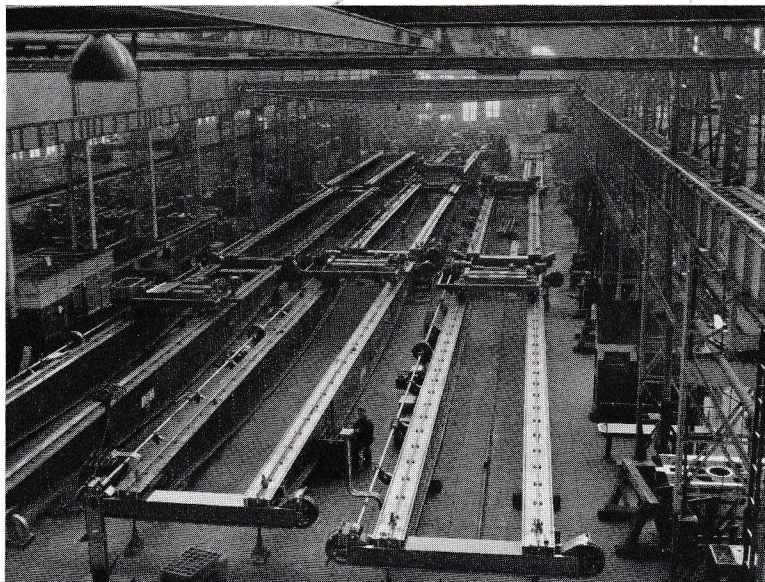
brackets, sheaves, and all the many other uses the huge Harnischfeger Corporation has for cast metals.

MODERN RESEARCH LABORATORIES

Before P&H engineers allow any work to be done on the construction of P&H cranes, they specify the standards demanded of all materials. Then, in modern, completely equipped physical and chemical laboratories these materials are tested to be sure that they measure up to these specifications. Crane specialists in these laboratories perform exhaustive tests—before materials are finally selected.

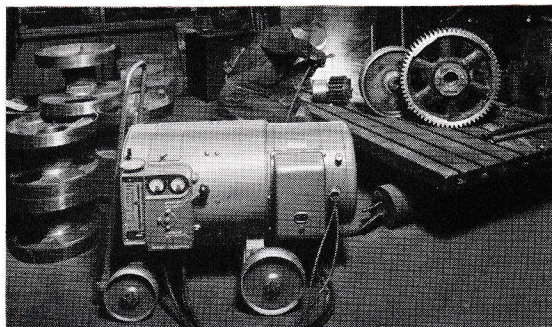


View of one of the P&H crane assembly bays showing nine cranes being assembled and tested before shipment.



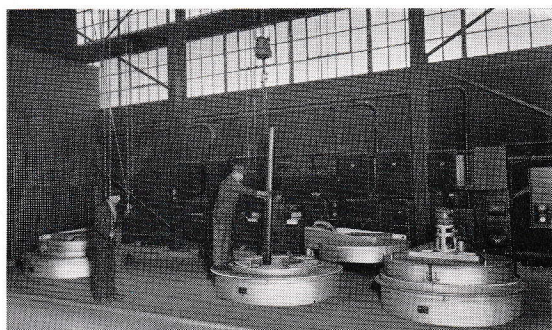
THE MOST MODERN AND COMPLETE PLANT FACILITIES IN THE INDUSTRY

A MODERN WELDERY — USING P&H - HANSEN WELDERS



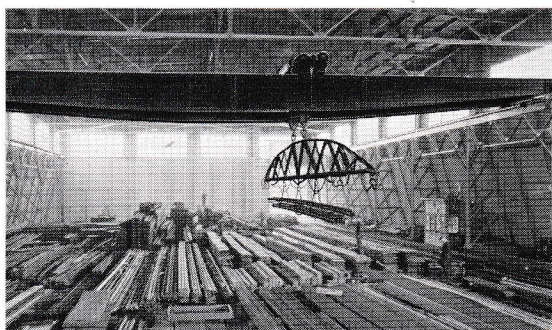
Arc Welding! The very name is synonymous with P&H engineers who years ago realized the advantages it brought to modern industry. Under the guidance of K. L. Hansen, inventor of the P&H-Hansen Welder, the Harnischfeger Corporation developed one of the largest and most complete welderies in the world. As one of the strongest advocates of this new method of metal fabrication, P&H engineers employ electric arc welding throughout the complete line of P&H Excavators, and wherever practical, on P&H Cranes, and by certified welders.

WELDED PARTS NORMALIZED AND ANNEALED



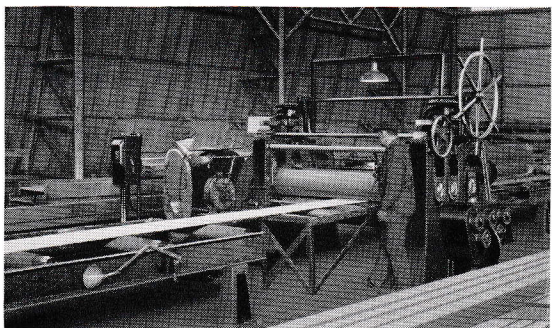
To further advance welding technique, P&H Welding Engineers made many discoveries relative to the internal stresses and strains developed in a welded unit. To relieve these forces and to obtain the maximum strength and working life of welded gears, end trucks, etc., they normalize and heat-treat welded parts in these modern, scientifically controlled furnaces. This seemingly small point of the manufacturing process is vitally necessary to keep machinery aligned and to eliminate weld failures in the field—yet few but P&H have made it standard practice.

STEELS ARE REROLLED



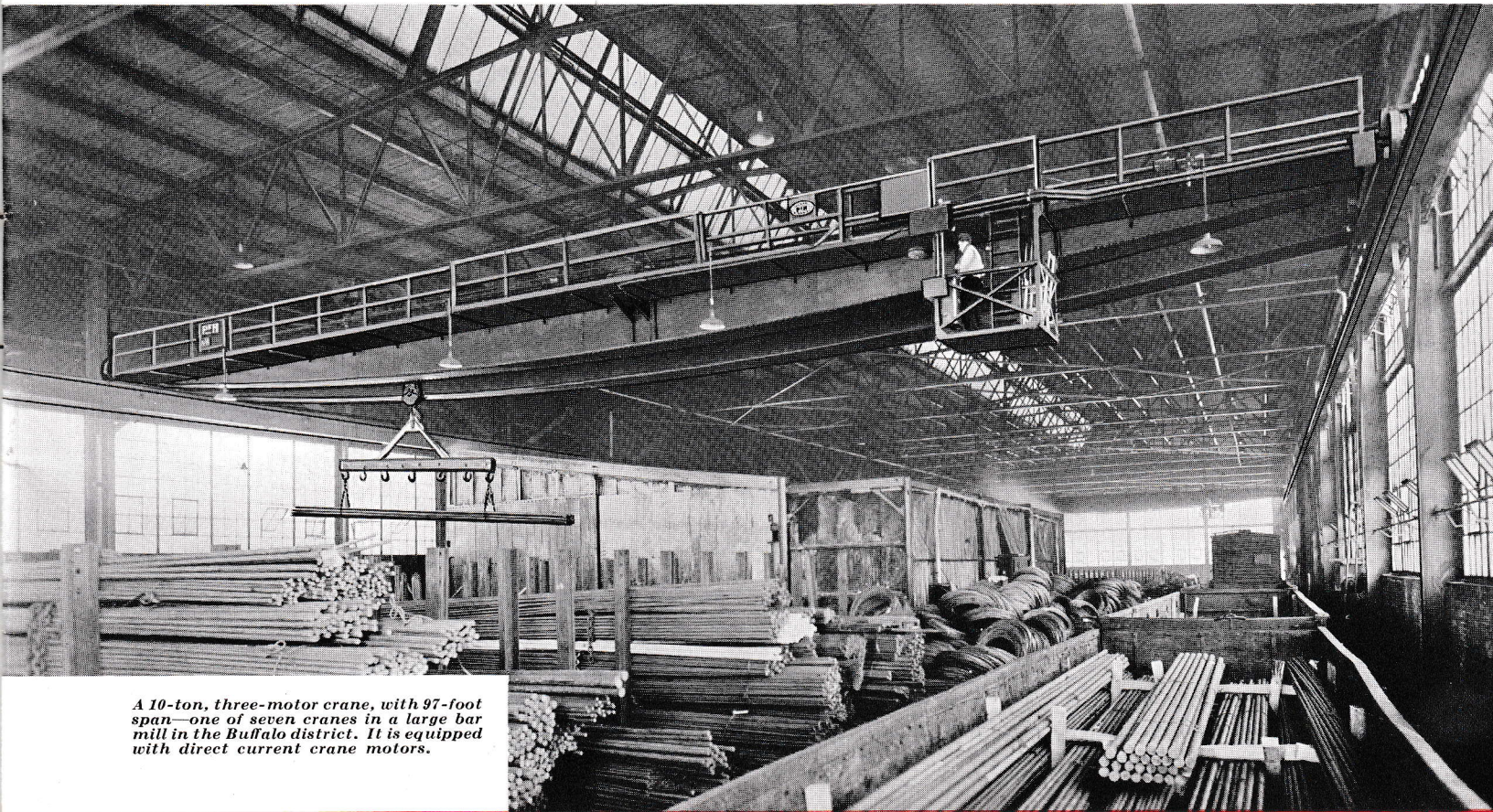
Hundreds of tons of steel! Plate upon plate, sheet upon sheet of rolled alloy steels, I-Beams, bars of "cold rolled," bars of Nickel, High Carbon and all other types of steels needed to keep so large a concern operating are kept in this orderly P&H steel warehouse. Rolled plates to be used in girders are "trued up" in huge peening rolls that take out all irregularities. That's why P&H cranes maintain proper alignment through years of service without bowing or developing definite sags common with cranes not built to such high standards.

THE USE OF ALLOY STEELS

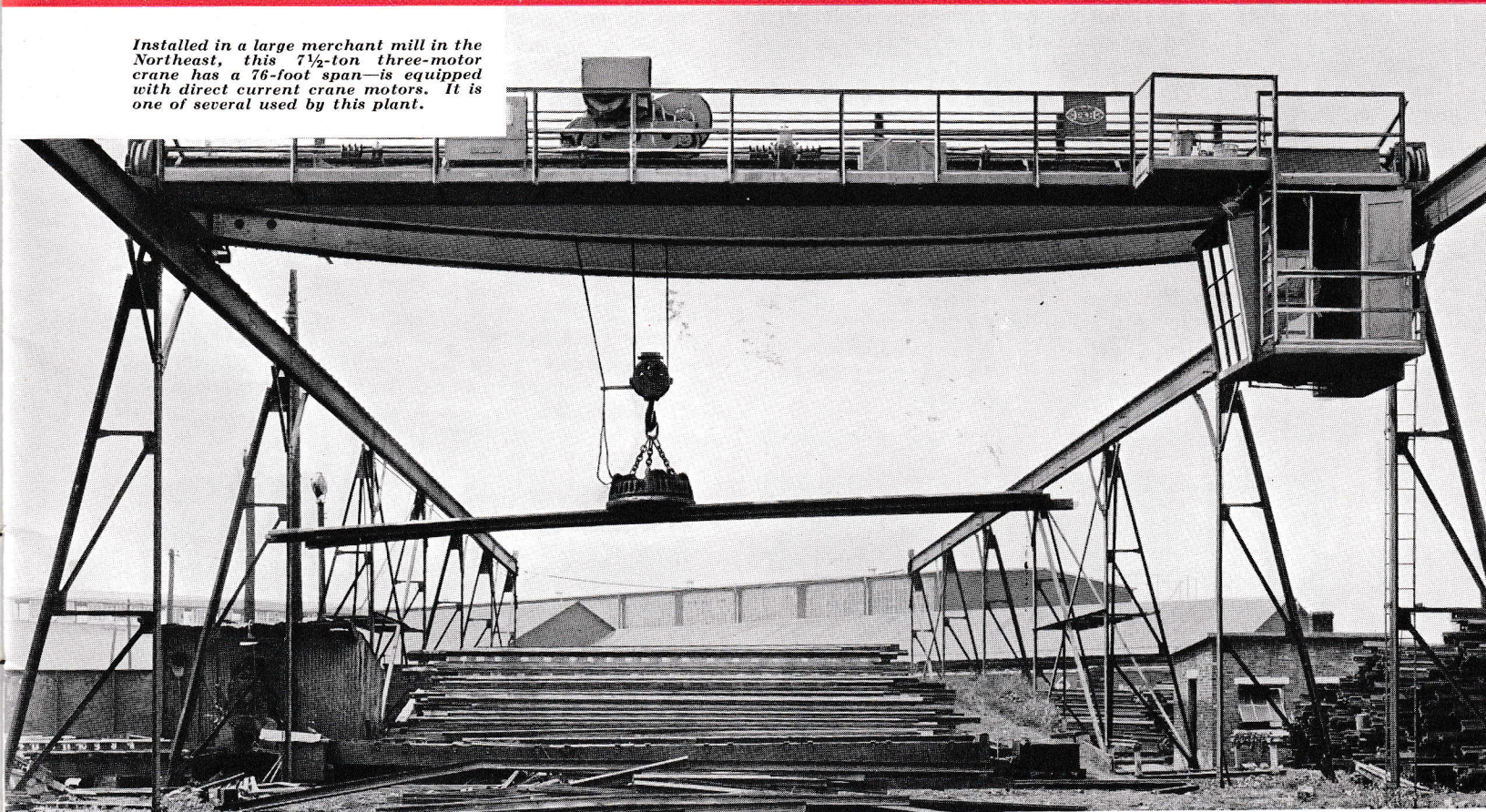


In the construction industry where resistance to heavy jolts, jerks and impacts is vitally important, P&H rolled steel, all-welded, excavators have set new marks for the field to shoot at. However, it is significant to note that with their unequaled background in the art of welded alloy steel fabrication, P&H crane engineers are conservative in its use. Knowing its capabilities and its limitations as few others do, they apply it to best advantage in all P&H cranes—wherever its particular assets are desirable.

INDUSTRIAL CRANES



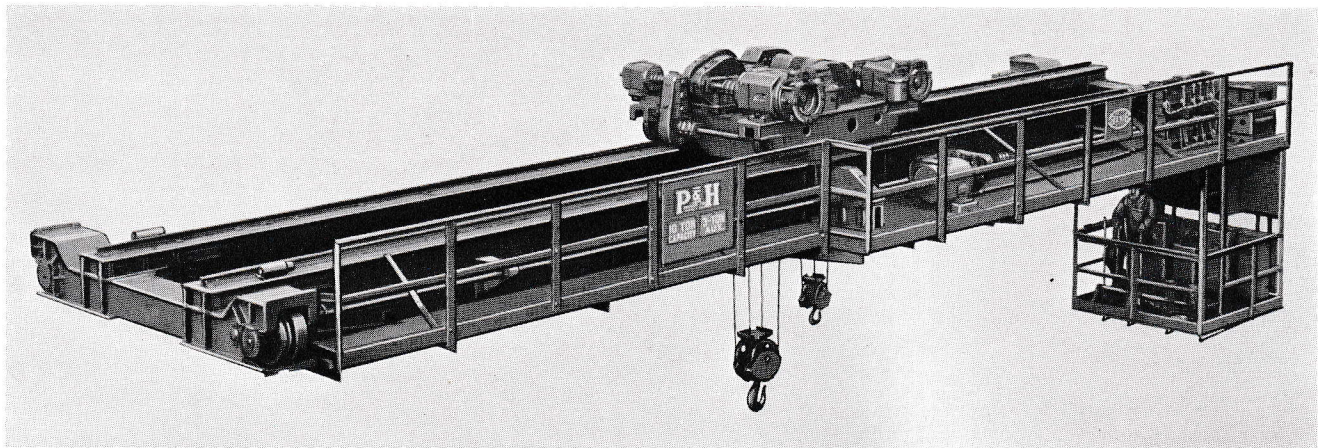
A 10-ton, three-motor crane, with 97-foot span—one of seven cranes in a large bar mill in the Buffalo district. It is equipped with direct current crane motors.



Installed in a large merchant mill in the Northeast, this 7½-ton three-motor crane has a 76-foot span—is equipped with direct current crane motors. It is one of several used by this plant.

STANDARD TYPE "H" CRANE

FOR CONTINUOUS HIGH SPEED SERVICE



P&H Standard Type "H" Crane—equipped with horizontal drive.

BOX SECTION OR I BEAM GIRDER TYPE BRIDGE

The Type "H" Roller Bearing Crane is the most popular of all cranes for general duty service. Owing to its efficient heavy duty design, it has been outstandingly successful in all types of industries. It offers the advantages of maximum accessibility, low maintenance with all modern safety measures and the latest details of crane construction.

The Type "H" crane bridge is built in either the I-Beam or box girder type of construction, with either type girder having ample sections to resist all vertical and lateral loading without undue deflection. Girder ends are notched and provided with heavy seat angle con-

nections to the truck for maximum loading. In addition, butt angles are used to obtain an assembly connection for the vertical alignment of the drive machinery. Liberal gusset plates connect the bottom cover plate of the girders to the trucks—assuring the lateral alignment of the bridge drive. Bolts and rivets fit snugly in drilled and reamed holes to develop the fullest strength of all connections. Trolley rails are securely fastened to the girders by means of rolled steel clips. An accessible platform extends the full length of the bridge on the machinery side, is built solid to the girder, and carries a double member hand rail and safety toe angle.

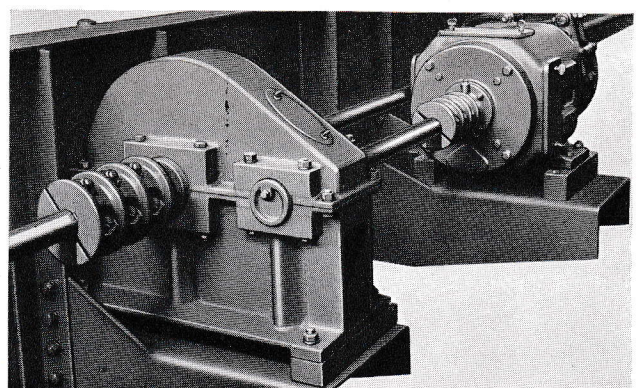
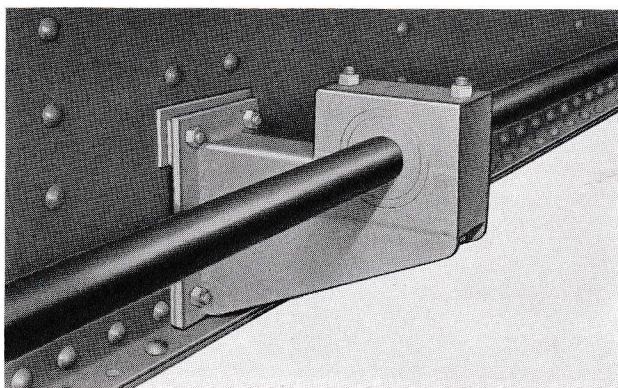
HORIZONTAL TYPE TRUCK DRIVE

FOR 15", 18" AND 21" WHEELS

The horizontal truck drive for type "H" Cranes is the same for both the I-Beam and box girder type bridge. This horizontal drive has been designed to offer the advantages of M.C.B. roller bearing truck construction in lighter capacity cranes at a minimum cost to the purchaser without sacrificing any desirable feature in quality build-up. M.C.B. roller bearing truck construction lowers maintenance cost by providing sealed enclosure protection against all atmospheric conditions and decreasing the power consumption.

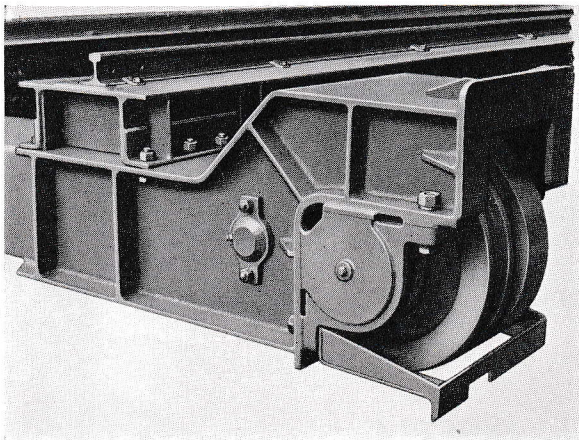
P&H Crane Gearing: Throughout the driving

mechanism of P&H Cranes, Special P&H-Built gears, with welded webs and high carbon steel rim stock are used. Pinions, too, are of high carbon steel, heat-treated to a minimum Brinell hardness of 230. With proper lubrication, gears and pinions will give years of heavy-duty service. However for still longer gearing life under the most severe conditions, gear and pinions are surface hardened to a minimum of 500 Brinell in a special hardening process. Applied after annealing and machining operations, this hardening process assures maximum strength and toughness. It is available at a reasonable cost addition.

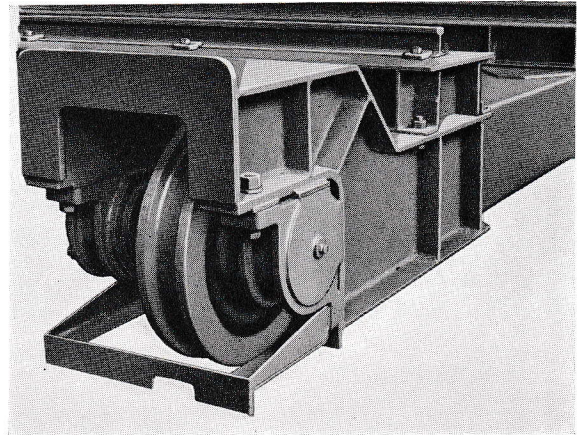


STANDARD TYPE "H" CRANE

Horizontal Type Truck Drive (Cont'd.)



Truck Drive (drive side)



Truck Drive (plain side)

P&H WELDED, ROLLER BEARING CONSTRUCTION

The P&H End Truck of double web construction has proved itself to be one of the most advanced crane developments of recent years. Its husky rolled steel box sections are reinforced by diaphragm plates and webbed stiffeners—welded into a single unit by welds that are actually stronger than the parent metal. It provides lateral stability and the strength and rigidity needed to withstand the shocks of rapid acceleration and sudden stops.

Bearing housings are mounted on machined pads of the heavy bearing seats at the end of the trucks and are

easily removable. End cross shaft bearings are capsule mounted directly in the webbed members on a horizontal line with the truck axle—this allows maximum crane wheel base with minimum spread trolley construction.

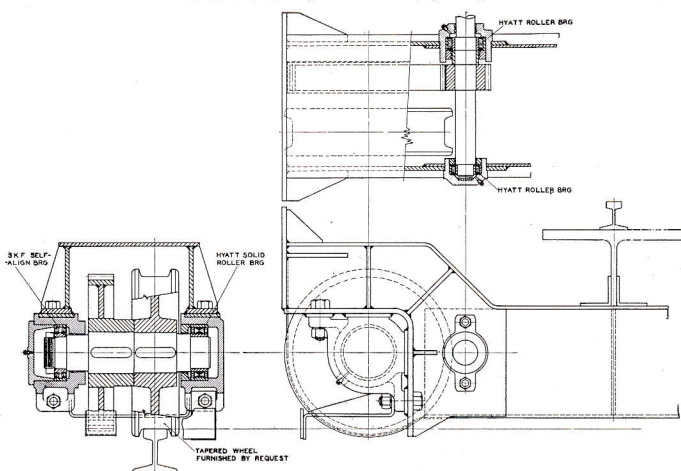
The bridge drive is of the horizontal gear-case type mounted in the center of the span on structural brackets. Hydraulic foot-brakes are furnished for bridge motors on all P&H cranes with operator cabs attached to the bridge.

BUILT WITH GEAR GUARDS OR FULLY ENCLOSED DESIGN

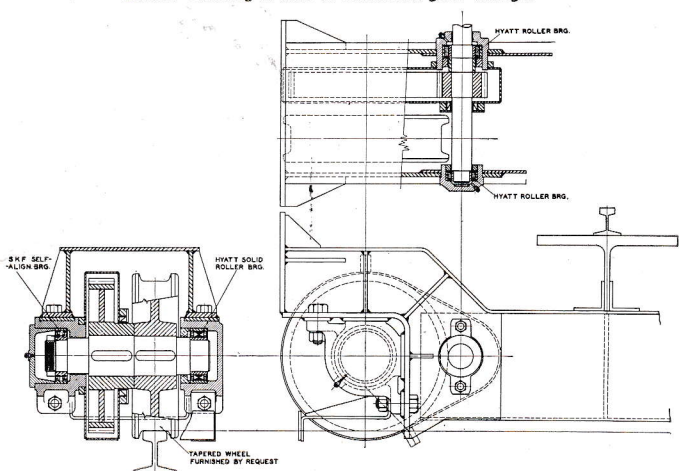
The cross sections below clearly show the provisions made in P&H welded end trucks to assure smooth, long-lived power transmission. The capsule type bearing construction used avoids the need of right and left-hand assembly. On the wheel-side, a solid roller bearing takes maximum radial loads. On the gear side a spherical-type roller bearing absorbs radial and thrust loads. The design allows ready replacement of gears, wheels or either bearing. It also easily accommodates the use of taper-tread wheels in directly providing for the resultant wheel thrust through the shouldered axle into the thrust bearing. Wheels may be of deep chilled iron, rolled steel or with hardened treads: ground true and matched for diameter.

On the guarded type of truck gear, a heavy welded guard protects the exposed face and side. For outside service or operation under dusty, gritty conditions, the heavy welded sheet-metal gear case for the truck gear and pinion offer complete protection against the weather and abrasive "fines." This gear case is split diagonally so that the wheel gear and bearing assembly can be rolled out as a complete unit. Handy inspection opening and cover make lubrication and maintenance a simple operation. A substantial rail stripper is used to clear the rail of any obstruction. Safety catches and lugs to prevent the trucks from leaving the rail or excessive drop in case of axle failure are also provided. The heavy end section of the truck provides a substantial bumper mounting for solid or spring-type chocks—as may be required.

Roller bearing truck with gear guard

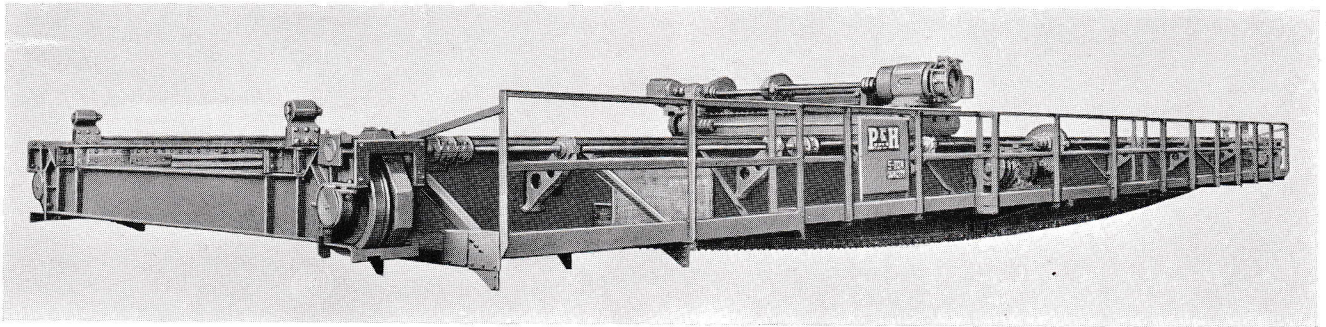


Roller bearing truck of enclosed gear design



STANDARD TYPE "H" CRANE

VERTICAL TYPE TRUCK DRIVE



P&H Type "H" Crane of box girder construction, equipped with vertical drive.

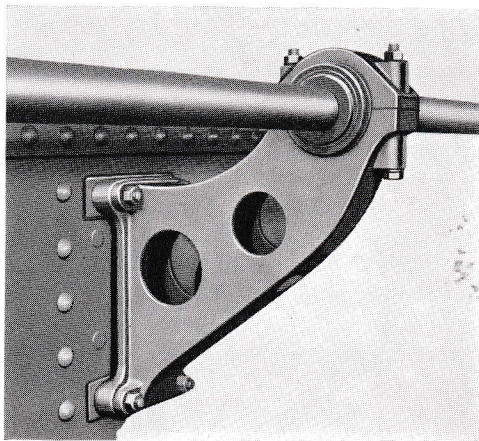
FOR 21" -- 24" -- 27" WHEELS

Shown above is the Type "H" Box Girder Bridge equipped with vertical truck drive to meet the requirements of the large capacity and higher speed cranes namely, those having wheels, 21, 24, or 27-inches in diameter.

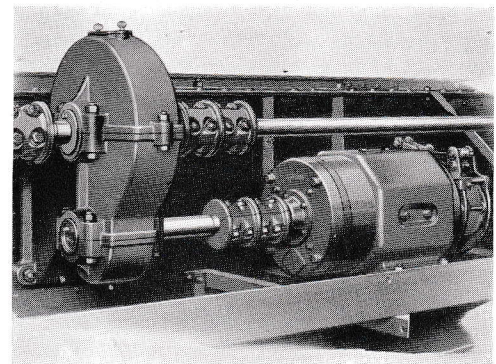
The standard bridge drive consists of a vertical gear case, mounted in the center of the span so that the drive shafts may be of equal length and capacity. (Horizontal gear case drive can also be furnished.) Sturdy, machined cross-shaft brackets are mounted rigidly on the girder at diaphragm points to furnish

ample support for the driving shaft and assure smooth power transmission. Capsule-mounted roller bearings are used at all vital points. Bearing housings are mounted on machined pads at the truck ends and provide full accessibility to all truck drive parts.

As on the horizontal type drive, bridge conductors are of round copper wire supported from strain end and intermediate supports unless otherwise specified. Sliding shoe type collectors give efficient current transmission under severest service. These are illustrated in the latter part of this catalog.



Cross-shaft bracket for vertical bridge drive shaft.



Vertical bridge drive.

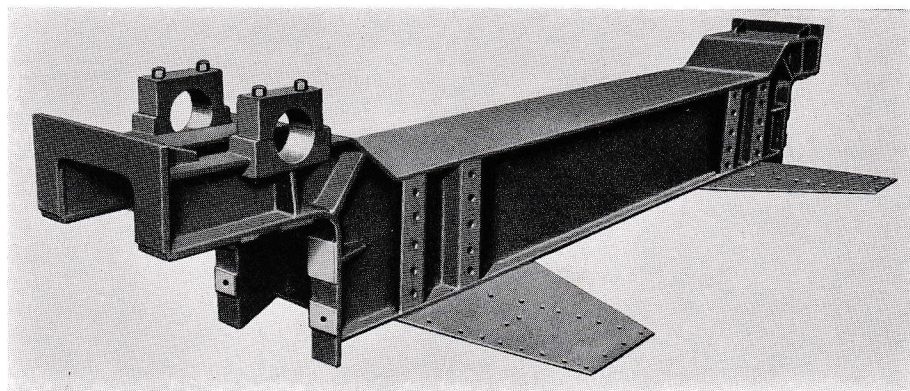
SMOOTHER POWER TRANSMISSION

The rigidly mounted motor, the well-supported drive shaft and the cut-tooth steel gears and pinions found on P&H Cranes are real assurance of positive, dependable power transmission through years of reliable service. The bridge motor is of a type especially designed for crane service and is located close to the center of the bridge, with shafts extending to the gear case. The bridge drive shaft is of ample size for the

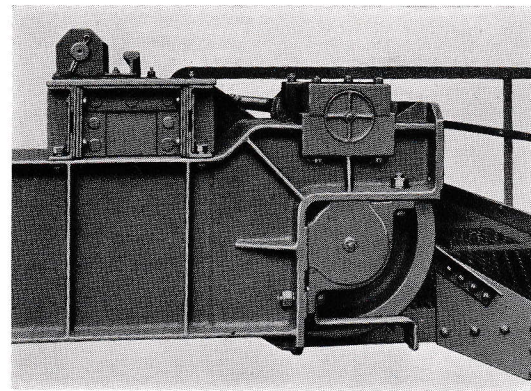
service required and is arranged in convenient lengths for handling. All gears and pinions are of the cut-tooth type with two gear reductions on standard crane bridge drives—one between the motor and the cross shaft and the other between the cross-shaft and the truck wheels. Motor gears are enclosed in a sealed gear case—gears run in a bath of heavy oil or light gear grease.

STANDARD TYPE "H" CRANE

P&H



Welded end truck for vertical drive.



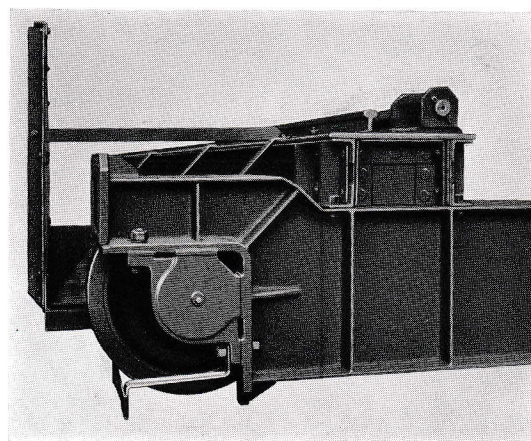
End truck—drive side.

EFFICIENT, HEAVY-DUTY DESIGN

The same general principles of welded design of rolled steels, described in the end trucks for use with the horizontal truck drive, are again used in the vertical-type drive. The husky box-section design, reinforced with diaphragm plates and web stiffeners, provides the strongest, yet lightest support for the bridge and driving mechanism yet developed.

Bridge truck wheels are of deep chilled iron, rolled steel or hardened-tread type ground true on the circumference to insure uniform, smooth travel. Rolled steel wheels are standard on cranes of higher speeds or exceedingly long spans. The bridge truck wheels are guarded by substantial steel plate fenders extending across the top of the runway rail, and not less than $\frac{1}{2}$ " below the top of the rail on either side. The truck gear is keyed to the axle and is located next to the wheel between bearings. The truck pinion is also mounted between bearings and on a short end section of the drive shaft, easily removable.

Cranes of 50-ton capacity and over, having spans of more than 60 feet, are usually provided with eight wheels mounted in heavy welded steel equalizing truck brackets.



End truck—plain side.

GUARDED OR FULLY ENCLOSED DESIGN

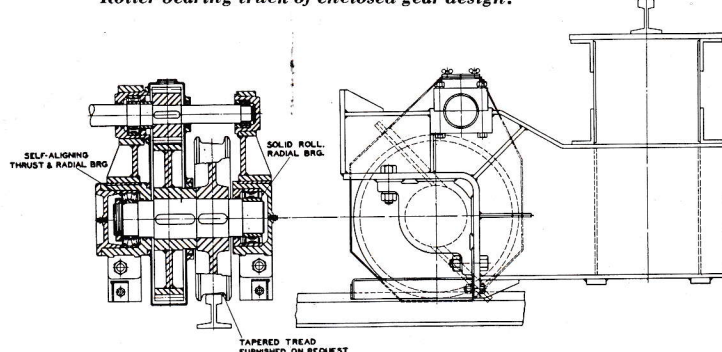
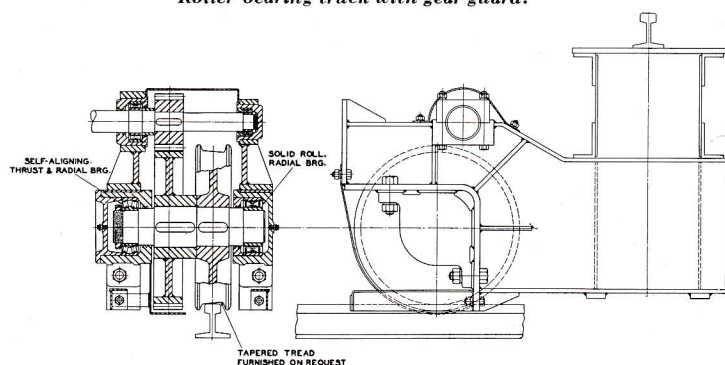
In applying roller bearings to the bridge axle, P&H engineers have used capsule-type bearings of a design to avoid right and left-hand assemblies. These bearings are selected to give long life under hard service conditions. On the wheel side, a solid roller bearing provides for maximum radial loads with minimum end clearance. On the gear side, with its inner race locked to the rotating axle, a spherical roller bearing takes all radial loads and end thrusts. This bearing can also be furnished in the tapered roller type. The complete

assembly is designed to permit easy and quick replacement of gear, wheel or either bearing, and readily accommodates the use of taper tread wheels in directly providing for the resultant wheel thrust through the shouldered axle into the thrust bearing.

Provisions for guarded or fully enclosed gearing have been made as with the horizontal type drive. Rail stripper and safety catches with additional safety lugs are standard equipment.

Roller bearing truck with gear guard.

Roller bearing truck of enclosed gear design.



STANDARD TYPE "H" CRANE

STANDARD OPEN TYPE CAB

FRONT LEVER STAND CONTROL

For many years the P&H Crane Cab with front lever stand control has been outstanding in its features for safety, accessibility, ease of operation and maximum vision.

The control drums are mounted in an inverted position in the rear of the cab with stub-operating levers connecting to the front stand levers by adjustable links. This provides a very convenient grouping of the operating handles close to the girder side, allowing the hook and load to be in constant sight of the operator.

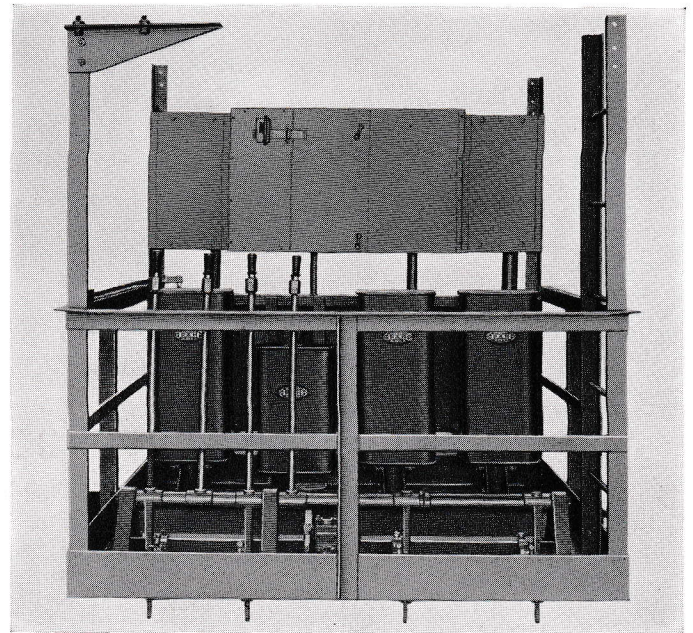
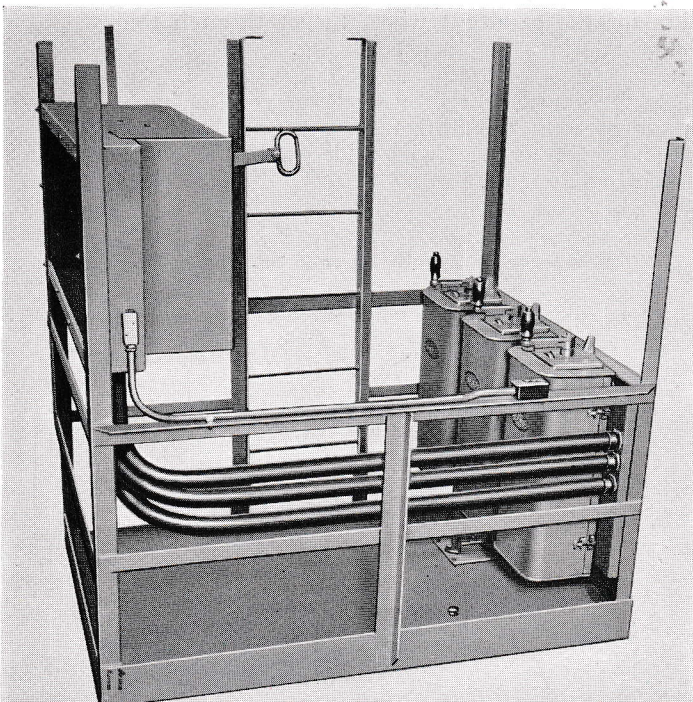
An indexed notch for each handle in the front stand and a positive star wheel arrangement in the controller drum give a perceptible position for the "off" as well as every operating contact point. The operator always has the "feel" of the load.

The main panel board is mounted in a completely enclosed cabinet above the compartment containing the controller drums. The main switch is of the "Safety" type operated with a handle outside the cabinet, which prevents opening of the cabinet doors until the switch has been opened and the current shut off. The handle is arranged for locking in the "off" position as a safety measure while work is being done on the crane. The cabinet protects all electrical parts and also prevents accidental contact with live parts.

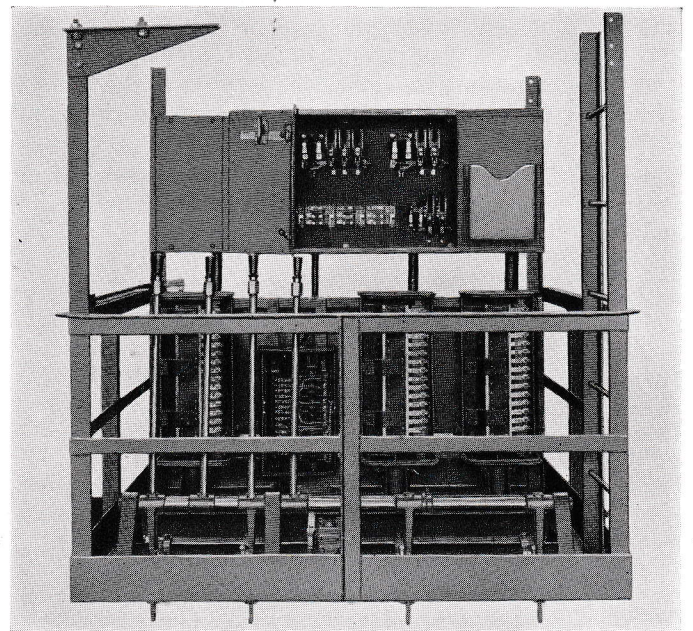
The resistance units are mounted above the cage, thus providing maximum accessibility and heat dissipation. All connecting leads run through rigid conduit.

The framework of the cab is entirely of steel, with solid bottom, except for lever openings. A toe strip extends completely around the bottom of the cage. Safety rails also extend around the three open sides.

Open type cab with radial arm operated drum controllers located in front.



View of standard four controller cab with drum and panelboard covers closed.



View of standard four controller cab, drum covers removed and panelboard covers opened.

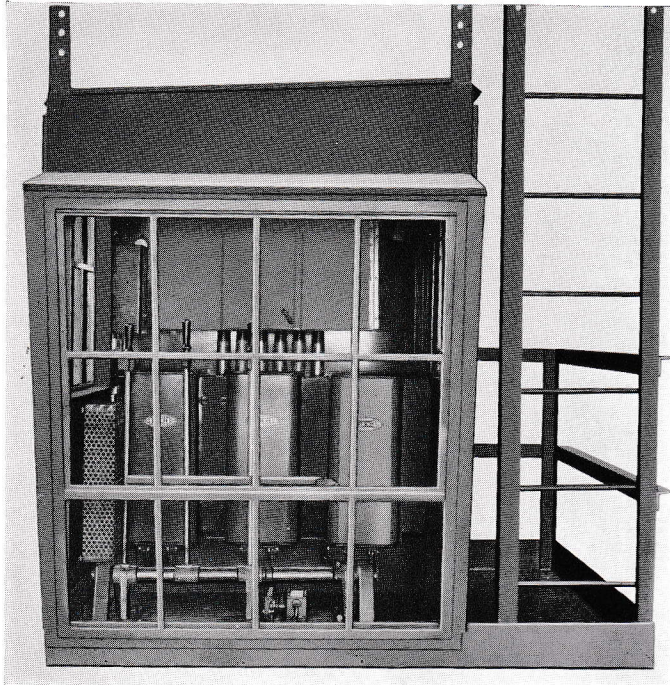
Transit board or rubber matting is furnished as an insulated floor. A ladder conveniently placed gives access to the platform along the drive shaft side.

P&H FRONT MOUNTED DRUM TYPE CONTROL

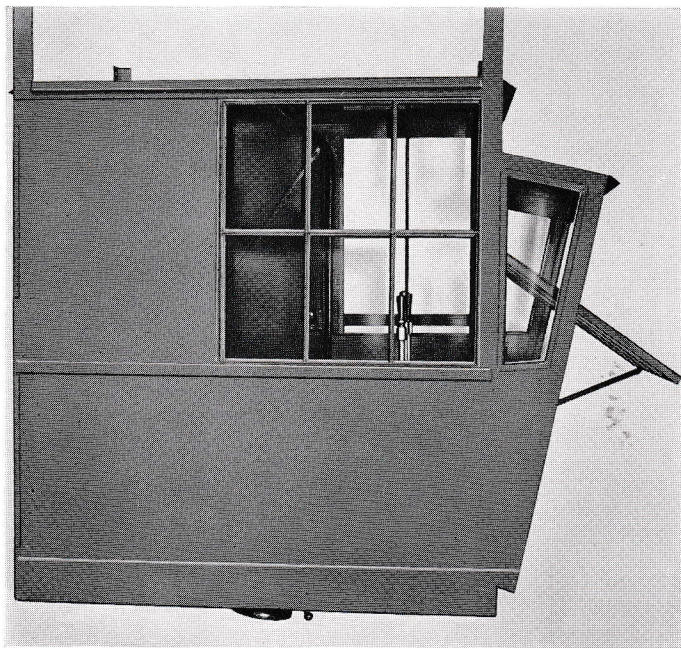
When requested, either the open or enclosed type cab can be furnished with drum controllers located in front. Operating handles may be of the "radial arm" or "straight line drive," as shown in cuts.

STANDARD TYPE "H" CRANE

STANDARD ENCLOSED TYPE CAB



Front view of the standard enclosed type cab showing full-vision front sash.



Girder side of the enclosed type cab showing the sliding sash and the pivoted section of the front sash.

FLOOR CONTROLLED CRANES

Where the service required of a crane is so intermittent that an operator is not needed constantly, the cage is omitted and the controllers are operated from the floor by suitably marked cords. The controllers are provided with spring returns so that when the cords are released by the operator, the control is immediately returned to the "off" position.

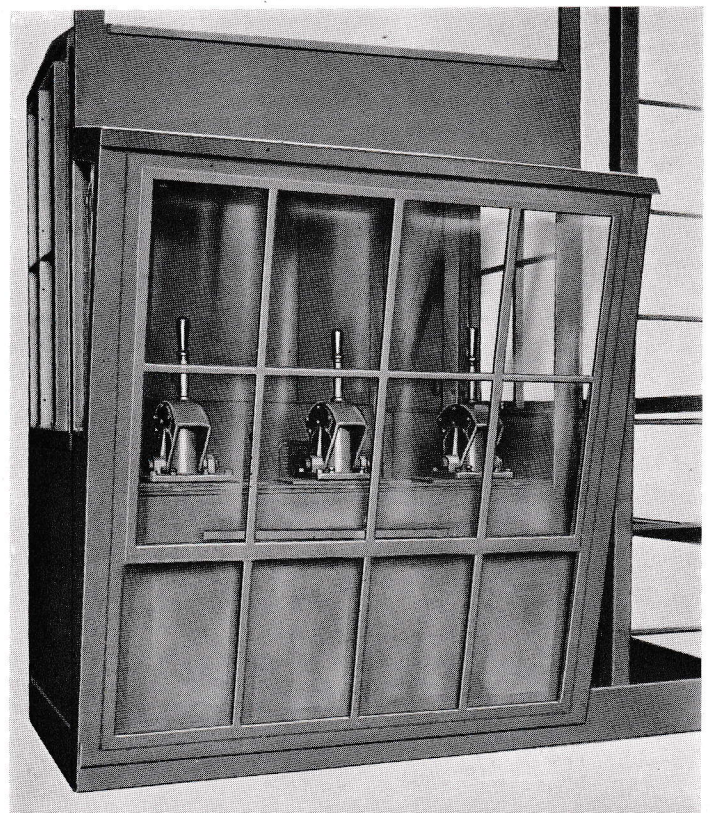
WITH THE P&H FULL-VISION SASH

The enclosed-type operator's cab is of weather-proof all-welded steel and glass construction, and has the same interior arrangement as the standard open-type cab described on the preceding page. It has the advantage of being completely weather-proof for maximum comfort in outside work, and is well ventilated for comfortable operation in the hot summer weather.

The framing has been modified somewhat from the standard open type cab to obtain a maximum vision sloping front and to accommodate a landing platform and a ladder attached to the door side. The forward part of the cab has a half-depth sliding sash on the girder side—a drop sash on the platform side and a full-depth sash on the front. The upper portion of the sloping front sash is arranged on a pivot, allowing maximum vision for the operator and enabling him to clean easily the sash from the inside of the cab. Also, it provides efficient ventilation.

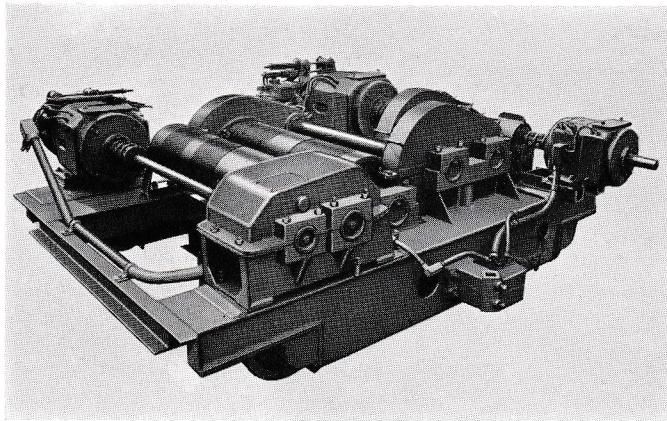
A landing platform with checkered plate floor is furnished on all enclosed cabs—of suitable width to allow entrance door to open with full door opening. A ladder on the forward part of the platform gives easy access to the bridge platform and eliminates the necessity of hatchways or openings through the cage roof.

Enclosed type cab with straight line lever operated drum controllers located in front.

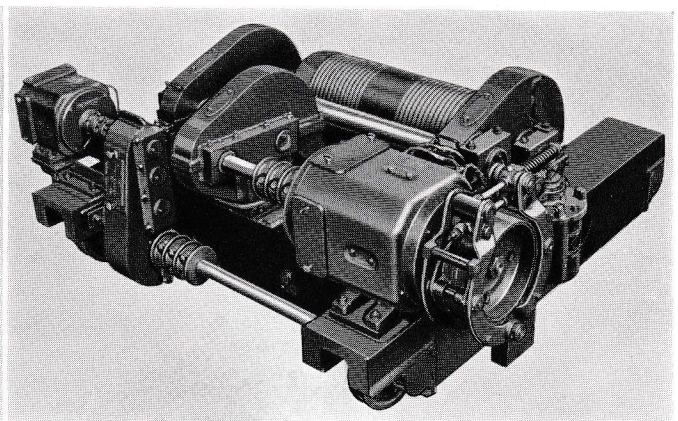


STANDARD TYPE "H" CRANE

TYPE "H" TROLLEY



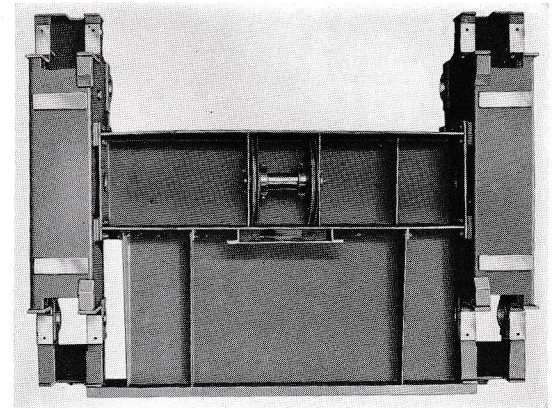
With auxiliary.



Without auxiliary.

ACCESSIBLE ... RIGID ... SAFE

The three most important factors of trolley design—accessibility, rigidity and safety—were the basis upon which the type "H" Trolleys were designed. Built with heavy roller bearings throughout, or, where desired, with modern sleeve bearing construction, their design is founded upon the use of conventional spur gear train of the three reduction type. There are no overhung gears and all bearings are located between trolley sides for greater compactness and easier accessibility. Any single shaft with its gears in place may be removed without disturbing any other shaft. The trolley drive consists of a steep reduction gear case mounted from the trolley side and engaging a drive gear on the axle shaft. Therefore, it is easy to get at all gears for repairs, maintenance and lubrication.



Welded trolley frame showing girt without auxiliary.

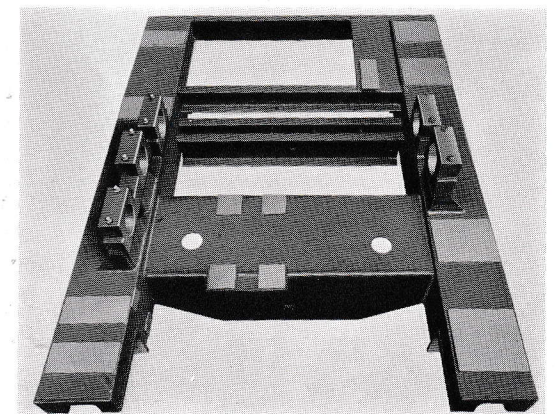
P&H RIGID ALL-WELDED CONSTRUCTION

The box-type construction of the trolley side provides maximum vertical and lateral stability—eliminates all undue deflection. The heavy single plate used to form the bottom and sides is welded to a cover plate to complete the section. Liberally reinforced, this structure is the strongest, yet lightest of its type known.

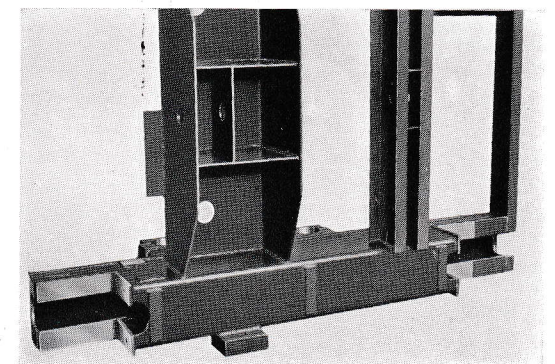
Heavy bearing seats, rigidly reinforced, are employed for truck axle bearings. Bearing blocks of solid steel, welded into or upon heavy section web members are mounted directly over the trolley side webs.

The main girt unit consisting of a single plate formed to an open box section, is rigidly welded and reinforced to prevent any roll in the girt member from swinging loads. On trolleys small enough to be delivered in one piece, the girt is welded into the trolley sides, forming a single unit trolley frame.

Large diameter drums and sheaves are machined to take the proper size cable without overlapping and assure maximum cable life. On A.C. cranes requiring a load brake, the unit is of the disc and ratchet type operating in an oil bath in the motor gear reduction case. (See cut, page 15.) Exceptionally good speed control is afforded with this type brake, but the use of load brakes is not advised on heavy, continuous-duty service cranes such as magnet or grab-bucket applications. For these conditions, on A.C. current, either regenerative or reverse torque control is recommended.



Top view of welded trolley frame. (With auxiliary.)



Welded girt connection to trolley side. (With auxiliary.)

STANDARD TYPE "H" CRANE

Important Features of Type "H" Trolleys.

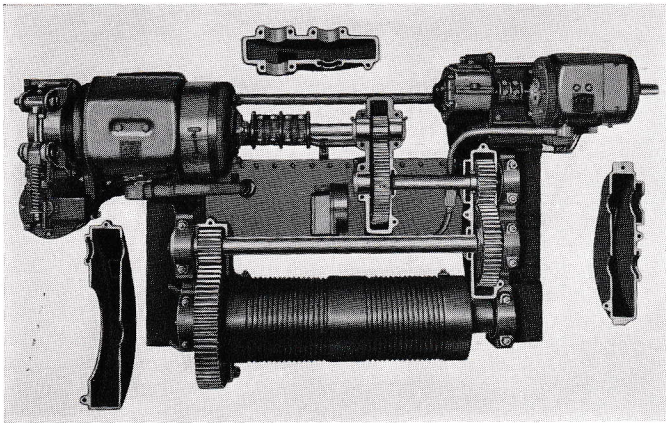
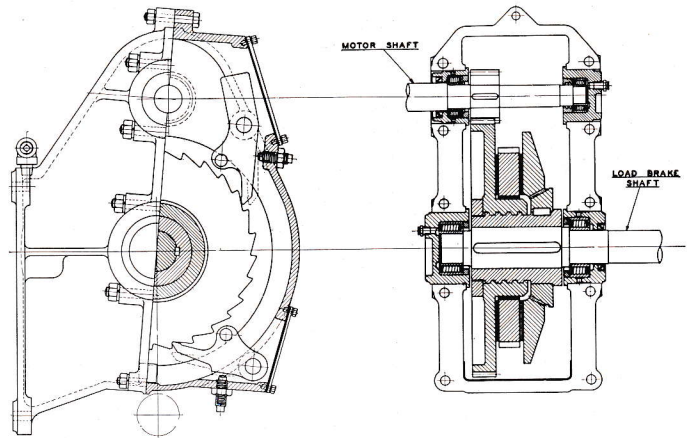


Photo shows the type "H" roller-bearing trolley with all gear cases removed. The type "H" trolley can also be furnished equipped with sleeve bearing if desired.



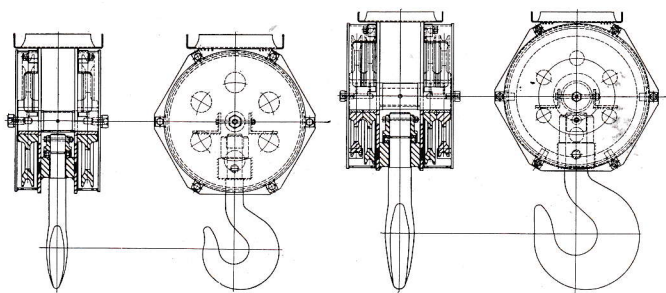
Cross section of disc and ratchet type load brake. Completely enclosed in the motor gear reduction case, operating in an oil bath, this brake affords exceptionally good speed control. It is used on both the type "H" roller or sleeve bearing trolleys.

The Type "H" trolley brings you all these features:

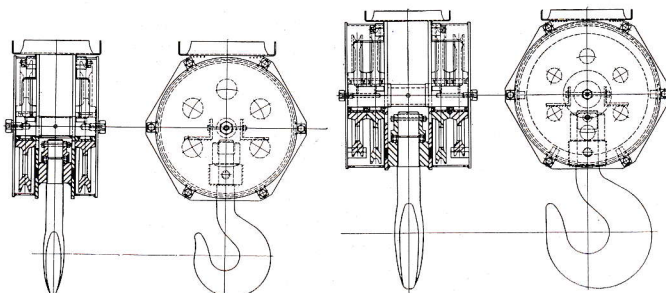
1. All shafts are turned over-all and ground true to size at bearing and gear points.
2. No gears or pinions are overhung.
3. All gears are of steel with precision cut teeth.
4. All pinions are of high carbon forged or rolled steel.
5. P&H all-welded construction assures maximum stability and rigidity.
6. Through bolts only are used.
7. All high speed gears run in an oil bath or soft grease. This insures adequate lubrication.
8. Drum and running sheaves are of large diameter.
9. All parts are easily accessible for repair or maintenance.
10. Liberal design assures long, efficient service.

STANDARD LOAD BLOCKS FOR ALL P&H CRANES

... Sleeve or Roller Bearing Types



Cross section of sleeve bearing load block.



Cross section of roller bearing load block.

These blocks are of all rolled steel welded construction to eliminate any chance for breakage if the block swings into obstructions. The design consists of load carrying side plates, bored for the hardened sheave pin and connected by welded-in milled end spacer angles and a solid steel cross-head.

Sheaves are of large diameter and have machined grooves to take the hoisting cable. Sheave hubs are fitted with wide-type roller bearings or, when specified, with wide pressed-in bronze bearings. A close fitting welded steel sheave guard bolts to the main load plates. Load hook is of forged steel supported from a threaded solid steel nut. Thrust bearing is enclosed of ball or roller bearing type seated in finished counter-bore of cross-head.

The main load plates form the support of the limit switch weight pan. Guard plates have bottom openings to prevent accumulation of dirt, water or ice. The completed block is easily accessible for inspection and maintenance—and is practically indestructible in service.

STANDARD TYPE "H" CRANE

HOIST, TROLLEY AND BRIDGE TRAVERSE SPEEDS OF TYPE "H" CRANES

Operating Speeds in Ft. P. M. for Roller Bearings Hook Type Industrial and Power House Elect. Tr. Cranes

Capacity	SLOW					MODERATE					FAST†				
	HOIST		TROLLEY		* BRIDGE	HOIST		TROLLEY		* BRIDGE	HOIST		TROLLEY		* BRIDGE
	Speed	Req'd. H.P.	Speed	Req'd. H.P.	Speed	Speed	Req'd. H.P.	Speed	Req'd. H.P.	Speed	Speed	Req'd. H.P.	Speed	Req'd. H.P.	Speed
3	33	7½	125	1	250	45	10	175	2	350	65	15	200	2	450
5	25	10	125	2	250	40	15	175	3	350	65	25	200	4	450
7½	25	15	125	2	250	35	20	175	3	350	45	25	200	4	450
10	25	20	125	3	250	33	30	175	4	350	45	38	200	6	450
15	20	25	125	3	250	32	38	175	4	350	42	50	200	6	450
20	15	25	125	6	250	24	38	175	8	350	32	50	200	10	450
25	14	30	125	6	250	18	38	175	8	350	25	50	200	10	450
30	12	30	125	8	250	18	45	175	10	350	25	60	200	15	450
35	12	38	100	8	200	17	50	150	10	300	20	60	175	15	400
40	11	38	100	8	200	17	60	150	10	300	20	75	175	15	400
45	10	38	100	8	200	16	60	150	10	300	20	75	175	15	400
50	10	45	100	10	150	14	60	150	15	250	20	85	175	15	300
60	10	50	100	10	150	15	75	150	15	250	20	100	175	15	300
75	9	60	75	15	150	13	85	100	20	250	16	100	125	20	300
85	8	60	75	15	150	13	100	100	20	...	..	...	...	...	...
100	8	75	75	15	150	11	100	100	20	...	..	...	...	...	...
125	6	75	75	20	100	8	100	100	30	...	..	...	...	...	...
150	5	75	50	20	100	7	100	75	30	...	..	...	...	...	...
175	4	75	50	20	100	6	100	75	30	...	..	...	...	...	...
‡200	4	2-38	35	2-15	100	6	2-60	50	2-20	...	..	...	...	...	...
‡250	3	2-38	35	2-15	100	5	2-60	50	2-20	...	..	...	...	...	...
‡300	3	2-50	35	2-20	100	4	2-60	50	2-25	...	..	...	...	...	...

*H.P. of bridge drive motor depends upon span of crane.

‡Double trolley crane.

†Extra fast speeds can be had when duty cycle operation demands.

IMPORTANT SAFEGUARDS FOR USING CLEARANCE DIMENSIONS

Clearance dimensions given in the following pages of this catalog cover standard cranes of moderate operating speeds as given in above chart and are to be used for estimating purposes only. Dimensional data for cranes requiring fast or extra fast speeds may vary from these lists. Before any actual construction is started by prospective crane users, certified clearance prints should be obtained from the engineering department of the Harnischfeger Corporation to show exact dimensions of the crane recommended for the capacity, speeds and degree of service.

The type of the crane to be used and any special features should depend upon the exact conditions under which it will be operated and the specific functions to be undertaken. In this regard, it cannot be too strongly emphasized that the recommendations of P&H engineers, based on their knowledge and experience, should be given careful consideration and, circumstances permitting, the policy of adhering to the use of builders' standard equipment should govern. Therefore, it is very important that liberal clearances based on the type "H" Cranes be used in new building construction so that the crane user may benefit by these advantages. Liberal space permits the selection of the best equipment that any builder can economically and quickly provide.

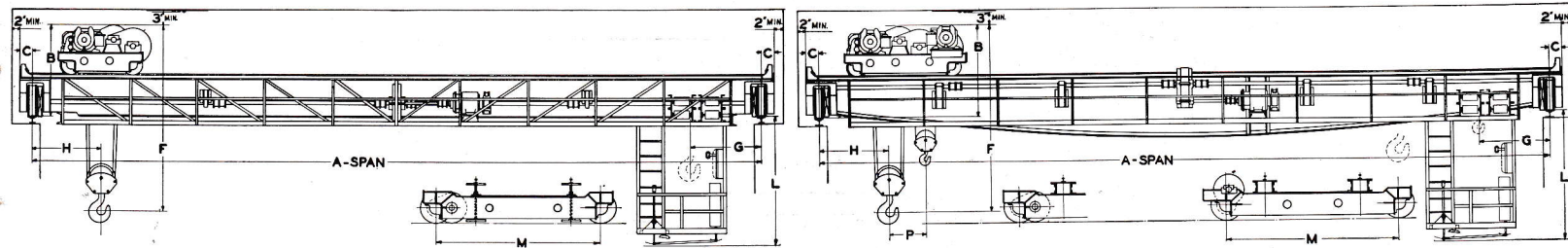
STANDARD TYPE "H" CRANE

CLEARANCE DIMENSIONS

Standard Type "H" Four-Wheel Crane

I Beam Construction

Box Girder Construction



TYPE HR—HR I BEAM GIRDERS

Capacity Tons	A Span	B	C	F	G	H	L	M	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
5	20'	4'-11"	8 $\frac{1}{2}$ "	6'-2"	2'-9"	2'-8"	7'-9"	9'-0"	11000	50
	30'	4'-11"	8 $\frac{1}{2}$ "	6'-2"	2'-9"	2'-8"	7'-9"	9'-0"	12500	50
	40'	4'-11"	8 $\frac{1}{2}$ "	6'-2"	2'-9"	2'-8"	7'-9"	9'-0"	13500	50
	50'	4'-11"	8 $\frac{1}{2}$ "	6'-2"	2'-9"	2'-8"	7'-9"	9'-0"	15000	50
10	20'	5'-4"	8 $\frac{1}{2}$ "	6'-11"	2'-10"	3'-0"	7'-9"	9'-6"	17500	50
	30'	5'-4"	8 $\frac{1}{2}$ "	6'-11"	2'-10"	3'-0"	7'-9"	9'-6"	19000	50
	40'	5'-10"	8 $\frac{3}{4}$ "	6'-11"	2'-10"	2'-11"	7'-9"	9'-10"	20300	50
	50'	5'-10"	8 $\frac{3}{4}$ "	6'-11"	2'-10"	2'-11"	7'-9"	9'-10"	22000	50
15	20'	5'-10"	8 $\frac{3}{4}$ "	7'-4"	3'-2"	2'-8"	7'-9"	10'-10"	24000	50
	30'	5'-10"	8 $\frac{3}{4}$ "	7'-4"	3'-2"	2'-8"	7'-9"	10'-10"	25500	50
	40'	5'-10"	8 $\frac{3}{4}$ "	7'-4"	3'-2"	2'-8"	7'-9"	10'-10"	27500	50
	50'	5'-10"	8 $\frac{3}{4}$ "	7'-4"	3'-2"	2'-8"	7'-9"	10'-10"	29000	50

TYPE HR-HR BOX GIRDERS

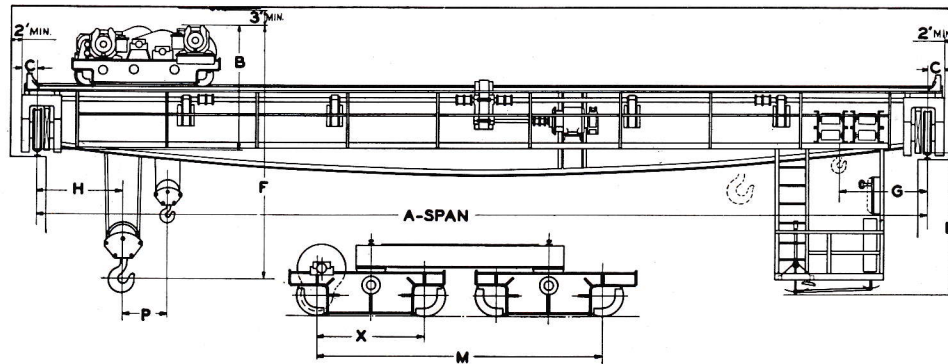
Capacity Tons	A Span	B	C	F	G	H	L	M	P	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
5	40'	5'-0"	8 $\frac{1}{2}$ "	TO MAIN HOOK	2'-9"	2'-8"	7'-9"	9'-9"	.....	14000	50
	50'	5'-0"	8 $\frac{1}{2}$ "		2'-9"	2'-8"	7'-9"	9'-11"	.....	15500	50
	60'	5'-0"	8 $\frac{1}{2}$ "		2'-9"	2'-8"	7'-9"	9'-11"	.....	17000	50
	70'	5'-0"	8 $\frac{1}{2}$ "		2'-9"	2'-8"	7'-9"	11'-7"	.....	19000	50
	80'	5'-6"	8 $\frac{3}{4}$ "		3'-0"	2'-11"	7'-9"	12'-1"	.....	20500	50
	100'	5'-6"	8 $\frac{3}{4}$ "		3'-0"	2'-11"	7'-9"	14'-5"	.....	25000	50
10	40'	5'-5"	8 $\frac{1}{2}$ "	TO MAIN HOOK	2'-11"	3'-0"	7'-9"	10'-3"	.....	20800	50
	50'	5'-11"	8 $\frac{3}{4}$ "		2'-11"	2'-11"	7'-9"	10'-9"	.....	22500	50
	60'	5'-11"	8 $\frac{3}{4}$ "		2'-11"	2'-11"	7'-9"	10'-11"	.....	23500	50
	70'	5'-11"	8 $\frac{3}{4}$ "		2'-11"	2'-11"	7'-9"	11'-7"	.....	25500	50
	80'	5'-11"	8 $\frac{3}{4}$ "		2'-11"	2'-11"	7'-9"	12'-9"	.....	27000	50
	100'	6'-3"	9 $\frac{1}{4}$ "		3'-1"	3'-0"	7'-9"	14'-4"	.....	32000	60
15 3 Ton Aux.	40'	5'-11"	8 $\frac{3}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	11'-7"	3'-5"	28000	50
	50'	5'-11"	8 $\frac{3}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	11'-9"	3'-5"	29500	50
	60'	6'-3"	9 $\frac{1}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	12'-2"	3'-5"	31500	60
	70'	6'-3"	9 $\frac{1}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	12'-4"	3'-5"	33500	60
	80'	6'-3"	9 $\frac{1}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	13'-0"	3'-5"	35500	60
	100'	6'-3"	9 $\frac{1}{4}$ "	7'-4"	2'-3"	2'-8"	7'-9"	14'-4"	3'-5"	42000	60
20 3 or 5 Ton Aux.	40'	6'-6"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	11'-10"	4'-0"	33500	60
	50'	6'-6"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	12'-0"	4'-0"	36000	60
	60'	6'-6"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	12'-2"	4'-0"	38500	60
	70'	6'-6"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	12'-4"	4'-0"	41000	60
	80'	6'-6"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	13'-0"	4'-0"	44000	60
	100'	6'-9"	9 $\frac{1}{4}$ "	8'-1"	2'-6"	2'-10"	7'-9"	14'-4"	4'-0"	51000	70
25 3 or 5 Ton Aux.	40'	6'-6"	9 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	11'-10"	4'-0"	42500	60
	50'	6'-6"	9 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	12'-0"	4'-0"	44500	60
	60'	6'-9"	9 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	12'-3"	4'-0"	47000	70
	70'	6'-9"	9 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	12'-4"	4'-0"	49500	70
	80'	6'-9"	9 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	13'-0"	4'-0"	52000	70
	100'	6'-11"	10 $\frac{1}{4}$ "	8'-5"	2'-6"	2'-10"	7'-9"	14'-6"	4'-0"	60000	80
30 5 or 10 Ton Aux.	40'	7'-1"	9 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	11'-6"	4'-5"	50000	70
	50'	7'-1"	9 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	11'-8"	4'-5"	53000	70
	60'	7'-1"	9 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	12'-2"	4'-5"	55000	70
	70'	7'-3"	10 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	13'-0"	4'-5"	58500	80
	80'	7'-3"	10 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	13'-2"	4'-5"	62000	80
	100'	7'-3"	10 $\frac{1}{4}$ "	9'-0"	2'-10"	3'-4"	7'-9"	14'-5"	4'-5"	70000	80
40 10 or 15 Ton Aux.	40'	7'-6"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	13'-2"	4'-10"	64500	80
	50'	7'-6"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	13'-4"	4'-10"	66500	80
	60'	7'-6"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	13'-6"	4'-10"	69000	80
	70'	7'-10"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	13'-8"	4'-10"	72500	100
	80'	7'-10"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	13'-9"	4'-10"	76000	100
	100'	7'-10"	10 $\frac{1}{4}$ "	10'-3"	3'-1"	3'-6"	7'-9"	14'-5"	4'-10"	84000	100

NOTE: 10-ton crane can be furnished with 3-ton aux. hoist, dimensions B and F do not change.

STANDARD TYPE "H" CRANE

CLEARANCE DIMENSIONS

Standard Type "H" Box Girder Crane — 8 Wheel Type



Capacity Tons	Span A	B	C	F	G	H	L	M	P	X	Max. Load per Each Wheel in Lbs.	Size Run- way Rail, Lbs. per Yd.
30 10 Ton Aux.	70'	8'-3"	12"	9'-3"	3'-0"	3'-3"	8'-6"	14'-0"	4'-0"	5'-0"	31800	80
	80'	8'-3"	12"	9'-3"	3'-0"	3'-3"	8'-6"	14'-0"	4'-0"	5'-0"	35000	80
	90'	8'-3"	12"	9'-3"	3'-0"	3'-3"	8'-6"	14'-0"	4'-0"	5'-0"	37000	80
	100'	8'-3"	12"	9'-3"	3'-0"	3'-3"	8'-6"	14'-0"	4'-0"	5'-0"	39000	80
40 10 Ton Aux.	50'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	35800	80
	60'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	37500	80
	70'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	39500	80
	80'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	42300	80
	90'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	43500	80
50 15 Ton Aux.	100'	8'-6"	12"	10'-6"	3'-3"	3'-9"	8'-6"	14'-0"	4'-10"	5'-0"	45000	80
	50'	8'-6"	12"	10'-9"	3'-3"	3'-9"	9'-0"	15'-0"	4'-7"	5'-0"	41100	80
	60'	8'-6"	12"	10'-9"	3'-3"	3'-9"	9'-0"	15'-0"	4'-7"	5'-0"	43000	80
	70'	8'-6"	12"	10'-9"	3'-3"	3'-9"	9'-0"	15'-0"	4'-7"	5'-0"	45400	80
	80'	8'-6"	12"	10'-9"	3'-3"	3'-9"	9'-0"	15'-0"	4'-7"	5'-0"	48600	80
60 15 Ton Aux.	90'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-4"	4'-7"	5'-4"	52500	80
	100'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-4"	4'-7"	5'-4"	54800	80
	50'	8'-6"	12"	10'-9"	3'-3"	3'-9"	9'-0"	15'-6"	4'-7"	5'-0"	47600	80
	60'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-10"	4'-7"	5'-4"	51100	80
	70'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-10"	4'-7"	5'-4"	53500	80
75 15 Ton Aux.	80'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-10"	4'-7"	5'-4"	55800	80
	90'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-10"	4'-7"	5'-4"	58700	80
	100'	9'-0"	13"	10'-9"	3'-3"	3'-9"	9'-0"	15'-10"	4'-7"	5'-4"	60800	100
	50'	9'-9"	13"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	56300	100
	60'	9'-9"	13"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	59500	100
100 15 Ton Aux.	70'	10'-3"	14"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	62300	100
	80'	10'-3"	14"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	64600	100
	90'	10'-3"	14"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	67500	100
	100'	10'-3"	13"	12'-4"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	69700	100
	50'	10'-4"	14"	12'-10"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	74000	100
150 15 Ton Aux.	60'	10'-4"	14"	12'-10"	3'-3"	4'-6"	9'-6"	17'-10"	5'-0"	5'-4"	78000	100
	70'	11'-0"	15"	12'-10"	3'-3"	4'-6"	9'-6"	18'-7"	5'-0"	5'-7"	83000	100
	80'	11'-0"	15"	12'-10"	3'-3"	4'-6"	9'-6"	18'-7"	5'-0"	5'-7"	88200	100
	90'	11'-0"	15"	12'-10"	3'-3"	4'-6"	9'-6"	18'-7"	5'-0"	5'-7"	95800	100
	100'	11'-0"	15"	12'-10"	3'-3"	4'-6"	9'-6"	18'-7"	5'-0"	5'-7"	103000	171

P&H LIMITED HEADROOM CRANES

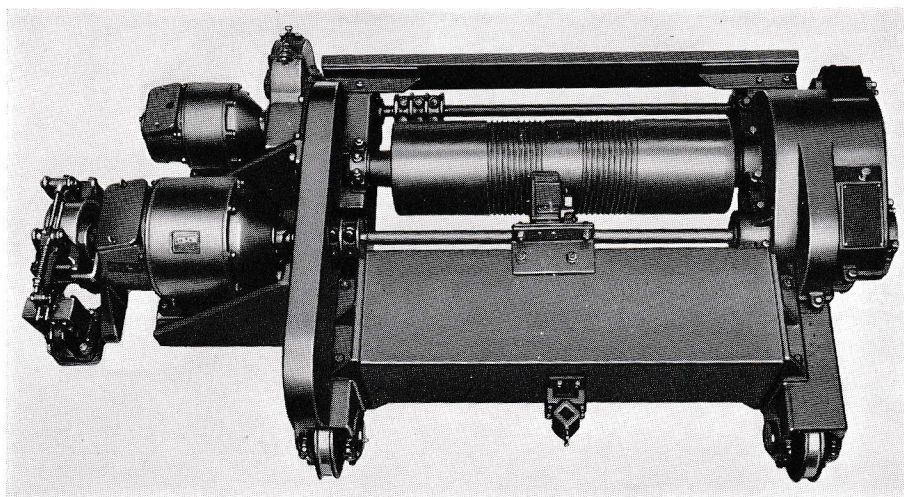
APPLICATION OF THIS TYPE OF CRANE

First and foremost to remember is the fact that this type of crane is rarely recommended for use in plants that have not already been built. Rather, it is a necessary adaption of the Standard Type "H" Crane to accommodate the advantages of higher vertical lifts in existing plants whose ceiling clearances were not originally designed for adequate overhead crane installations. In general, the bridge construction of P&H Limited Headroom Cranes is the same as those of the

Type "H", either box girder or I-beam design, and the same details of fabrication apply to either type. The main difference in construction is, of course, in the trolley where necessary revisions have been made to allow the low clearances desired.

Because of the inherent characteristics of the low headroom trolley design, type "KH" and "GH" cranes are restricted to the listed capacities of 3 to 15 tons only—operating with moderate hoisting speeds.

TYPE "K" ROLLER BEARING TROLLEY 3 TO 15 TON CAPACITY



Top view of Type "K" Roller Bearing Trolley.

DESIGNED FOR LOW HEADROOM—HIGH HOOK LIFT

The Type "K" Roller Bearing Trolley combines the advantages of low headroom and high hook lift with many of the important service features found in other P&H Crane trolleys. The design is built around the use of a compact-type hoist gear train (see page 20) with the gear case built into the front trolley side. The rear trolley side carries the trolley drive and on it both the trolley drive and the hoist motor are mounted from rigid brackets.

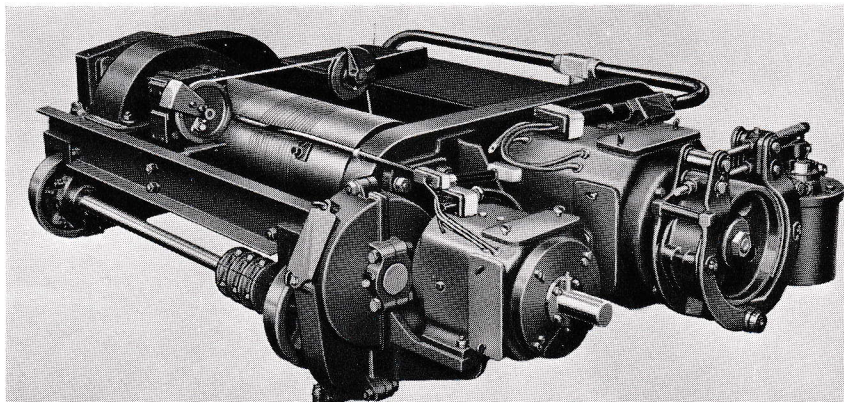
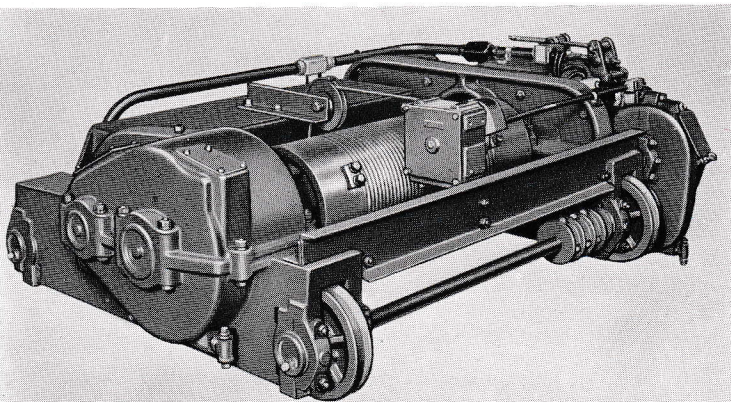
The two trolley sides are securely tied together through the main load girt and a structural end tie—eliminat-

ing all possibility of trolley side-roll or "skew." The large diameter drum is equipped with machined grooves to provide full lift without overlapping the cables—is carried from the drive shaft in the gear case with an outboard bearing in the opposite or rear trolley side.

Trolley wheels are carried on capsule-mounted roller bearings from bored seats in the trolley side-ends. Trolley drive is of two reduction spur gear type enclosed in tight-fitting gear cases. Complete wheel, gear, axle and bearing build-up may be rolled out of the trolley side after the gear-case cover and the bearing caps are removed.

Plain side of Type "K" Trolley, showing gear case.

Trolley drive side of Type "K" Trolley, showing motor support.

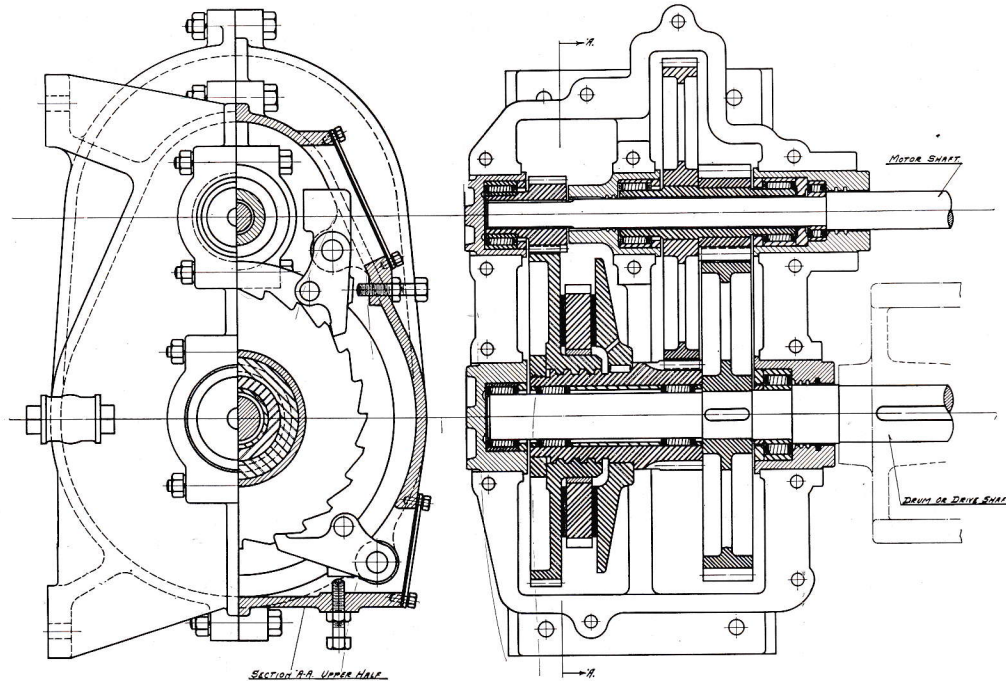


P&H LIMITED HEADROOM CRANES

Type "K" Trolley (Cont'd)

ROLLER BEARING HOIST UNIT

For Alternating or Direct Current Applications



Cross section of compact gear train used with Type "K" Roller Bearing Hoist Unit.

P&H TRIPLE REDUCTION DRIVE

As the cross-section above shows, two shaft centers are used for a triple reduction drive to provide the necessary gear changes, compactness, full accessibility and oil bath lubrication. The main drum or load drive shaft is of alloy heat-treated steel mounted on two capsule retained roller bearings. The drive or drum gear is keyed directly to this shaft and meshes with a driving pinion mounted on a sleeve with the intermediate gear. This intermediate gear sleeve is supported by two independent roller bearings through

which the motor or driveshaft passes. The intermediate drive pinion is cut on a sleeve on which the motor gear and mechanical load brake (when used) are assembled. This sleeve is supported from a roller bearing at each end and turns about the main drive or drumshaft. The motor or drive pinion is broached to take a six-splined driveshaft for easy assembly and is supported by two roller bearings. All gears are of alloy steel, with cut, stub teeth. All shafts on which roller bearings turn or are mounted, are hardened for the proper service requirement.

EASILY ADJUSTED MECHANICAL LOAD BRAKES

The load brake, when used, is of the screw and ratchet type, with two friction surfaces in contact with asbestos linings. The brake is easily and accurately adjustable when the cover is removed. Two heat-treated pawls are used to restrain the ratchet element from turning in the lowering direction. The brake is large enough to easily dissipate the heat generated while lowering a heavy load.

All gears, bearings and the brake element are lubricated

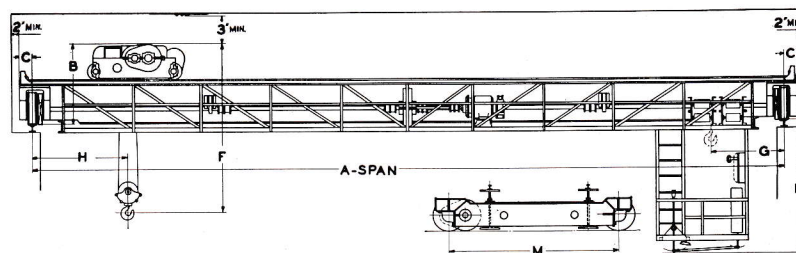
by means of an oil bath. Wide gear-case flanges, tight fitting capsules with oil returns from bearing and seals make a practically leakproof unit.

With trolley side mountings, this unit is used as the Type "K" low headroom trolley. With separate gear case adaptations, it is also used for the Type "KH" special purpose trolley (up to 150-ton Power House Duty) and for the standard auxiliary hoist unit on Type "H" trolleys.

P&H LIMITED HEADROOM CRANES

CLEARANCE DIMENSIONS

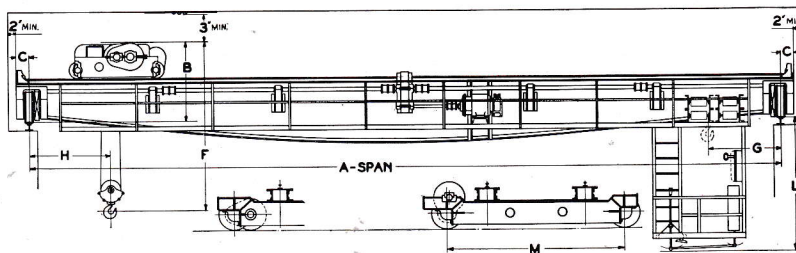
Low Headroom — I Beam Type "H" Crane with Type "K" Trolley



TYPE KR-HR

Capacity Tons	A Span	B	C	F	G	H	L	M	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
3	20'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-0"	8000	50
	30'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-0"	9500	50
	40'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-0"	11000	50
	50'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-0"	12500	50
5	20'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-6"	11000	50
	30'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-6"	12500	50
	40'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-6"	13500	50
	50'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-6"	15000	50
10	20'	4'-3"	8 1/2"	5'-1"	3'-5"	3'-3"	7'-9"	10'-0"	17500	50
	30'	4'-3"	8 1/2"	5'-1"	3'-5"	3'-3"	7'-9"	10'-0"	19000	50
	40'	4'-9"	8 3/4"	5'-1"	3'-5"	3'-3"	7'-9"	10'-4"	20300	50
	50'	4'-9"	8 3/4"	5'-1"	3'-5"	3'-3"	7'-9"	10'-4"	22000	50
15	20'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	10'-10"	24000	50
	30'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	10'-10"	25500	50
	40'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	10'-10"	27500	50
	50'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	10'-10"	29000	50

Low Headroom — Box Girder-Type "H" Crane with Type "K" Trolley

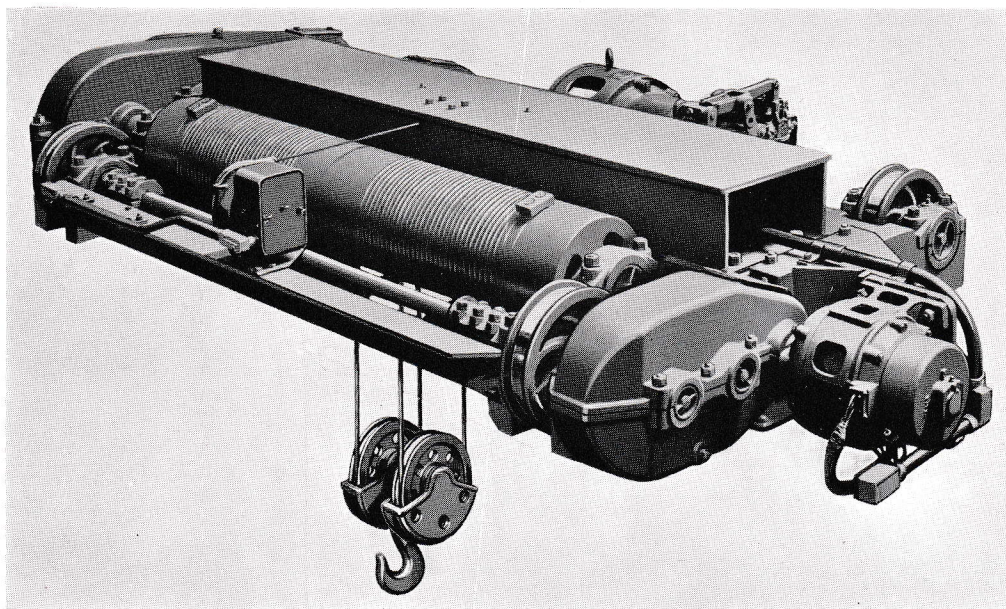


TYPE KR-HR

Capacity Tons	A Span	B	C	F	G	H	L	M	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
3	40'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-9"	11000	50
	50'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-11"	12500	50
	60'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	9'-11"	14000	50
	70'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	11'-1"	16000	50
	80'	3'-9"	8 1/2"	4'-2"	2'-11"	3'-2"	7'-9"	11'-9"	17500	50
5	40'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-9"	14000	50
	50'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-11"	15500	50
	60'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	9'-11"	17000	50
	70'	4'-2"	8 1/2"	4'-7"	3'-0"	3'-1"	7'-9"	11'-1"	19000	50
	80'	4'-8"	8 3/4"	4'-7"	2'-11"	3'-4"	7'-9"	11'-9"	20500	50
10	40'	4'-3"	8 1/2"	5'-1"	3'-5"	3'-3"	7'-9"	10'-9"	20500	50
	50'	4'-9"	8 3/4"	5'-1"	3'-4"	3'-6"	7'-9"	11'-3"	22500	50
	60'	4'-9"	8 3/4"	5'-1"	3'-4"	3'-6"	7'-9"	11'-5"	24000	50
	70'	4'-9"	8 3/4"	5'-1"	3'-4"	3'-6"	7'-9"	11'-7"	25500	50
	80'	4'-9"	8 3/4"	5'-1"	3'-4"	3'-6"	7'-9"	12'-9"	27000	50
15	40'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	11'-7"	27500	50
	50'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	11'-9"	29500	50
	60'	4'-9"	8 3/4"	5'-11"	3'-10"	3'-0"	7'-9"	12'-1"	31500	50
	70'	5'-2"	9 1/4"	5'-11"	3'-9"	3'-2"	7'-9"	12'-4"	33500	60
	80'	5'-2"	9 1/4"	5'-11"	3'-9"	3'-2"	7'-9"	13'-0"	35500	60

RESTRICTED HEADROOM CRANES

TYPE "G" ROLLER BEARING TROLLEY 3 TO 15 TONS CAPACITY



View showing the drum side of the Type "GR" low headroom trolley.

The design of the Type "G" trolley is similar to that of Type "K" trolley—being especially built only to meet existing conditions of restricted headroom.

RIGID FRAME CONSTRUCTION

The trolley sides are of rigid box section with all bearing brackets cast integrally, assuring permanent alignment. The girt connecting the two trolley sides is very strong and stiff to preserve perfect alignment between the sides.

MODERN HOISTING TACKLE

Hoist drum grooves are machine cut and are provided to take care of the full amount of rope required for the lift specified; $1\frac{1}{2}$ wraps are left on the drum with the hook in its lowest position. The sheaves are accurately grooved for the diameter of the rope. Substantial guards prevent the rope from leaving the sheaves. All sheaves are equipped with roller bearings revolving on hardened steel pins. All hoisting gears are enclosed in a cast gear case and operate in a constant bath of oil. Bearings throughout the entire hoisting unit are of the roller type, mounted and enclosed in individual self-contained, oil-tight housings. The roller assemblies and outer bearing raceways are readily removable from the trolley without dismantling the retaining housing.

All gear case bearings are arranged for automatic oil lubrication through gear splash and require no further

attention throughout the life of the crane. All other bearings are arranged for grease-gun lubrication.

TROLLEY DRIVE:

The trolley drive is a self-contained unit and consists of two trains of gears running in oil in the rear trolley side.

CAPSULE MOUNTED AXLE BEARINGS:

The axles are equipped with roller type capsule-mounted bearings which are readily removable from the trolley without dismantling the retaining housings. These are arranged for grease-gun lubrication and require only occasional attention.

LOWERING:

Lowering is entirely controlled by the crane operator and can be accomplished only by running the motor in the lowering direction.

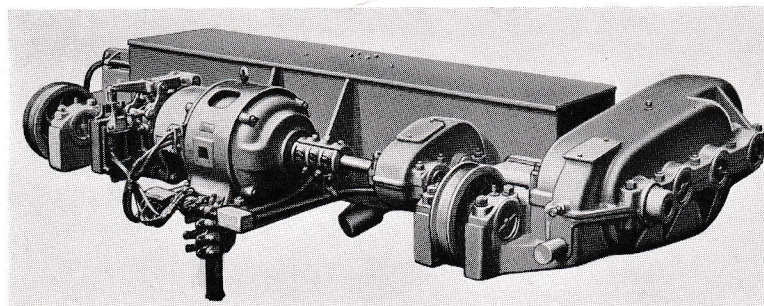
DYNAMIC BRAKING FOR D. C. CRANES:

On D. C. Cranes, control of the load in lowering is by means of dynamic braking supplemented by a powerful magnetic holding brake of sufficient capacity to hold the load independently.

MECHANICAL BRAKES ON A. C. CRANES:

On A. C. Cranes the load is at all times under control of the mechanical brake which is designed for fine, easy regulation in lowering. The brake is of the disc and ratchet type, provided with asbestos linings.

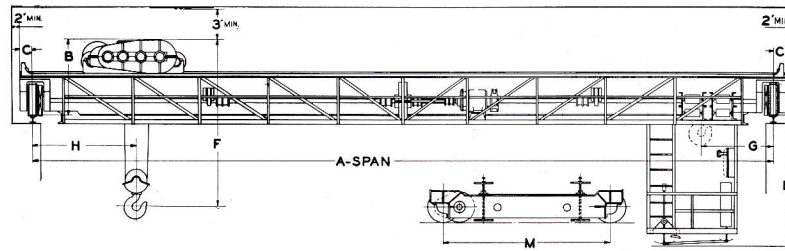
Type "G" Low Headroom Trolley, Motor Side.



RESTRICTED HEADROOM CRANES

CLEARANCE DIMENSIONS

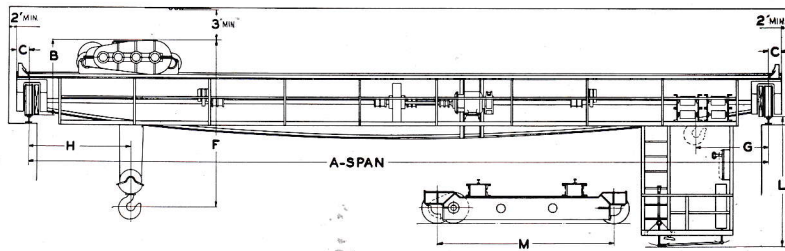
Restricted Headroom — I Beam Type "H" Crane with Type "G" Trolley



TYPE GR-HR

Capacity Tons	A Span	B	C	F	G	H	L	M	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
3	20'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	9'-6"	8000	50
	30'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	9'-6"	9500	50
	40'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	9'-6"	11000	50
	50'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	9'-6"	12500	50
5	20'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	9'-6"	11000	50
	30'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	9'-6"	12500	50
	40'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	9'-6"	13500	50
	50'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	9'-6"	15000	50
10	20'	3'-7"	8 1/2"	4'-0"	2'-9"	3'-2"	7'-9"	10'-6"	17500	50
	30'	3'-7"	8 1/2"	4'-0"	2'-9"	3'-2"	7'-9"	10'-6"	19000	50
	40'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	10'-10"	20300	50
	50'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	10'-10"	22000	50
15	20'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	10'-10"	24000	50
	30'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	10'-10"	25500	50
	40'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	10'-10"	27500	50
	50'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	10'-10"	29000	50

Restricted Headroom — Box Girder Type "H" Crane with Type "G" Trolley



TYPE GR-HR

Capacity Tons	A Span	B	C	F	G	H	L	M	Max. Load per Wheel in Lbs.	Runway Rail A.S.C.E. Std. Lbs. per Yd.
3	40'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	10'-3"	11000	50
	50'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	10'-5"	12500	50
	60'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	10'-5"	14000	50
	70'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	11'-7"	16000	50
	80'	3'-4"	8 1/2"	3'-6"	2'-7"	2'-10"	7'-9"	11'-9"	17500	50
5	40'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	10'-3"	14000	50
	50'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	10'-5"	15500	50
	60'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	10'-5"	17000	50
	70'	3'-4"	8 1/2"	3'-9"	2'-8"	2'-9"	7'-9"	11'-7"	19000	50
	80'	3'-10"	8 3/4"	3'-9"	2'-10"	2'-11"	7'-9"	12'-1"	20500	50
10	40'	3'-7"	8 1/2"	4'-0"	2'-9"	3'-2"	7'-9"	11'-3"	20500	50
	50'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	11'-9"	22500	50
	60'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	11'-11"	24000	50
	70'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	12'-1"	25500	50
	80'	4'-1"	8 3/4"	4'-0"	2'-8"	3'-2"	7'-9"	12'-9"	27000	50
15	40'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	11'-7"	27500	50
	50'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	11'-9"	29500	50
	60'	4'-1"	8 3/4"	4'-5"	2'-9"	3'-1"	7'-9"	11'-11"	31500	50
	70'	4'-6"	9 1/4"	4'-5"	2'-8"	3'-1"	7'-9"	12'-4"	33500	60
	80'	4'-6"	9 1/4"	4'-5"	2'-8"	3'-1"	7'-9"	13'-0"	35500	60

LARGE CAPACITY CRANES

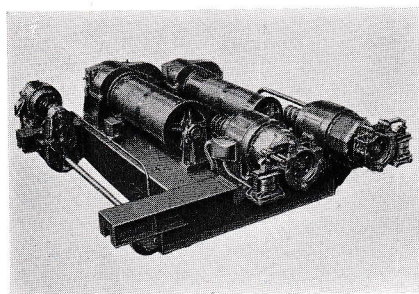
FOR INTERMITTENT SERVICE

P&H large capacity cranes might well be called "P&H Power House Cranes," inasmuch as the great majority of them have been built for use in the installation and maintenance of power house equipment.

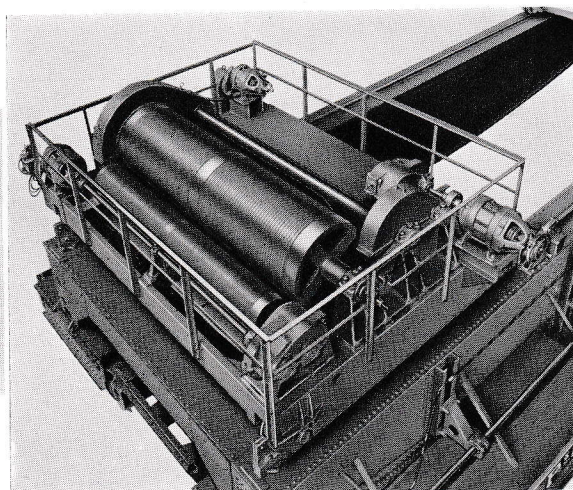
Cranes in this type of service are called upon to lift accurately, move and lower bulky generators and tur-

bines weighing sometimes hundreds of tons. At the same time, they are never called upon for continuous duty because of the very nature of their work. Because of this, their design combines all the features necessary for efficient high capacity performance with the many economies made possible by the intermittent or periodic duties they must perform.

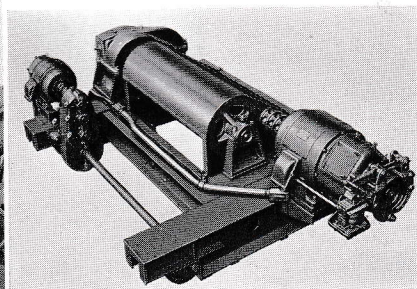
TYPE "KH" SLEEVE OR ROLLER BEARING TROLLEY FOR LARGE CAPACITY CRANES UP TO 300 TONS



15-Ton Type "KH" Crane Trolley, with 5-Ton Auxiliary Trolley.



150-Ton Type "KH" Trolley, with 25-Ton Auxiliary.



5-Ton, Single-Hoist Type "KH" Trolley.

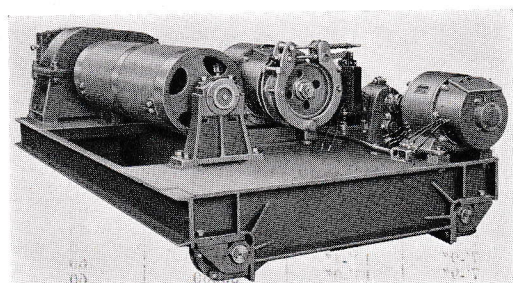
The Type "KH" Trolley is an assembly of the Type "K" Hoist Unit, mounted on the Type "H" welded trolley frame to meet special applications in service typical of powerhouse work, where variable hook spacings and slow hook hoisting speed are of paramount importance.

The Type "K" hoist unit, as described on page 20, is used with drum mounted directly on drive shaft and outboard bearings, or with additional gear reductions with bearing stands mounted directly on trolley frames with individual gear cases.

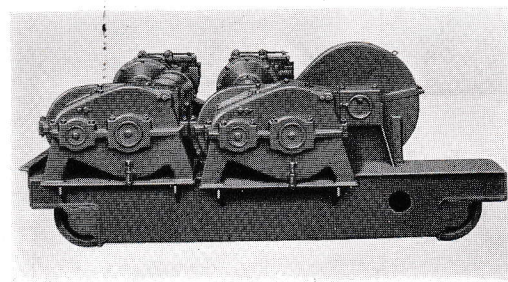
Machined pads on the trolley frame are used to align the gear drive and the hoist motors. The trolley frame consists of reinforced box section trolley sides, connected

by the main load girt and end ties—welded into one-piece construction when size will permit. Trolley sides have notched ends with heavy bearing seats to take M.C.B. type trolley wheel bearings of either sleeve or roller bearing build-up, as specified. The trolley drive consists of a triple reduction steeply-type gear case, supported from the trolley side, with the drive gear mounted on the wheel axle. A through-shaft connects the trolley side axles. The completed trolley is easily accessible for inspection or maintenance, and all shafting and connection gears can be removed individually.

While the Type "K" gear unit is normally of all-roller bearing construction, the remainder of the bearings, such as those in the trolley drive axle, etc., can be supplied with either roller or sleeve type, as desired.

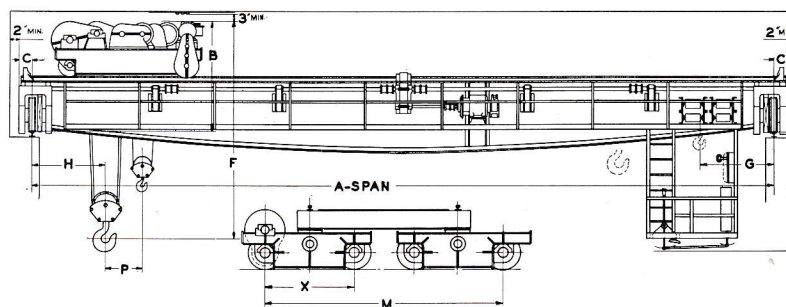


View of Type "KH" trolley, showing outboard drum bearings. Note the simple, compact gear case mounting of the type "KH" trolley.



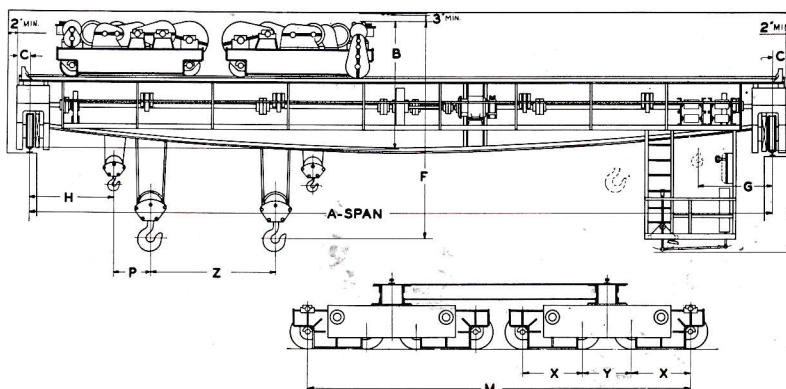
P&H LARGE CAPACITY CRANES

CLEARANCE DIMENSIONS 8-Wheel, Single-Trolley Type Crane



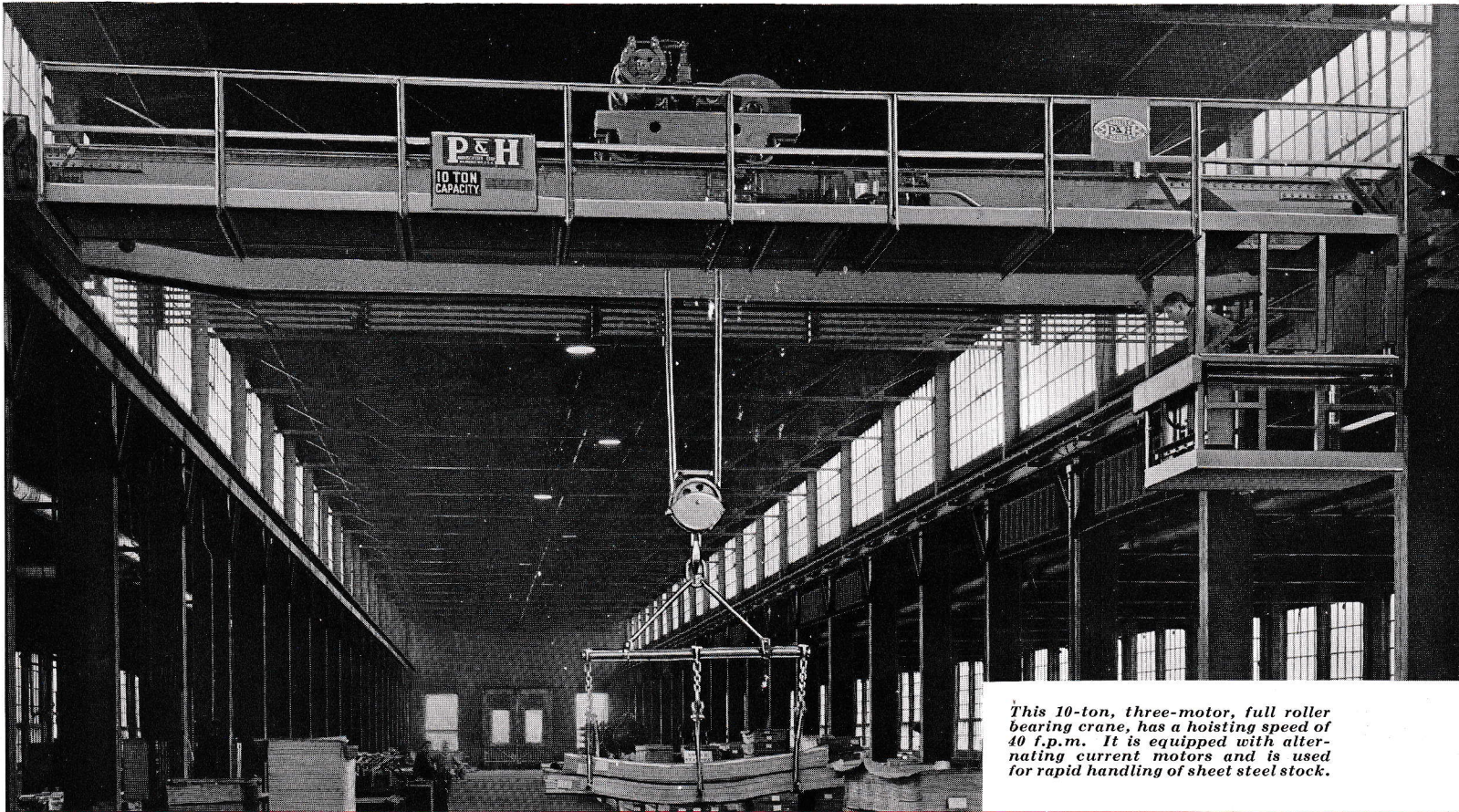
Capacity Tons	Span A	B	C	F	G	H	L	M	P	X	Max. Load for Each Wheel in Lbs.	Size Runway Rail Lbs. per Yd.
100 20-ton Aux.	50'	10'-4"	1'-1"	13'-10"	3'-0"	4'-9"	8'-0"	17'-4"	4'-10"	5'-4"	73000	100
	60'	10'-4"	1'-1"	13'-10"	3'-0"	4'-9"	8'-0"	17'-4"	4'-10"	5'-4"	77000	100
	70'	10'-4"	1'-1"	13'-10"	3'-0"	4'-9"	8'-0"	17'-4"	4'-10"	5'-4"	82000	100
	80'	10'-9"	1'-2"	13'-10"	3'-0"	4'-9"	8'-0"	17'-7"	4'-10"	5'-7"	87000	100
	90'	10'-9"	1'-2"	13'-10"	3'-0"	4'-9"	8'-0"	17'-7"	4'-10"	5'-7"	95000	100
125 25-ton Aux.	50'	12'-4"	1'-2"	16'-8"	3'-9"	5'-3"	8'-0"	19'-7"	5'-0"	5'-7"	88000	100
	60'	12'-4"	1'-2"	16'-8"	3'-9"	5'-3"	8'-0"	19'-7"	5'-0"	5'-7"	91300	100
	70'	12'-4"	1'-2"	16'-8"	3'-9"	5'-3"	8'-0"	19'-7"	5'-0"	5'-7"	94500	171
	80'	12'-4"	1'-2"	16'-8"	3'-9"	5'-3"	8'-0"	19'-7"	5'-0"	5'-7"	98000	171
	90'	12'-4"	1'-2"	16'-8"	3'-9"	5'-3"	8'-0"	19'-7"	5'-0"	5'-7"	102000	171
150 30-ton Aux.	50'	13'-0"	1'-2"	17'-6"	4'-3"	5'-3"	8'-0"	21'-7"	5'-5"	5'-7"	100000	171
	60'	13'-0"	1'-2"	17'-6"	4'-3"	5'-3"	8'-0"	21'-7"	5'-5"	5'-7"	105000	171
	70'	13'-0"	1'-2"	17'-6"	4'-3"	5'-3"	8'-0"	21'-7"	5'-5"	5'-7"	110000	171

16-Wheel, Double-Trolley Type Crane

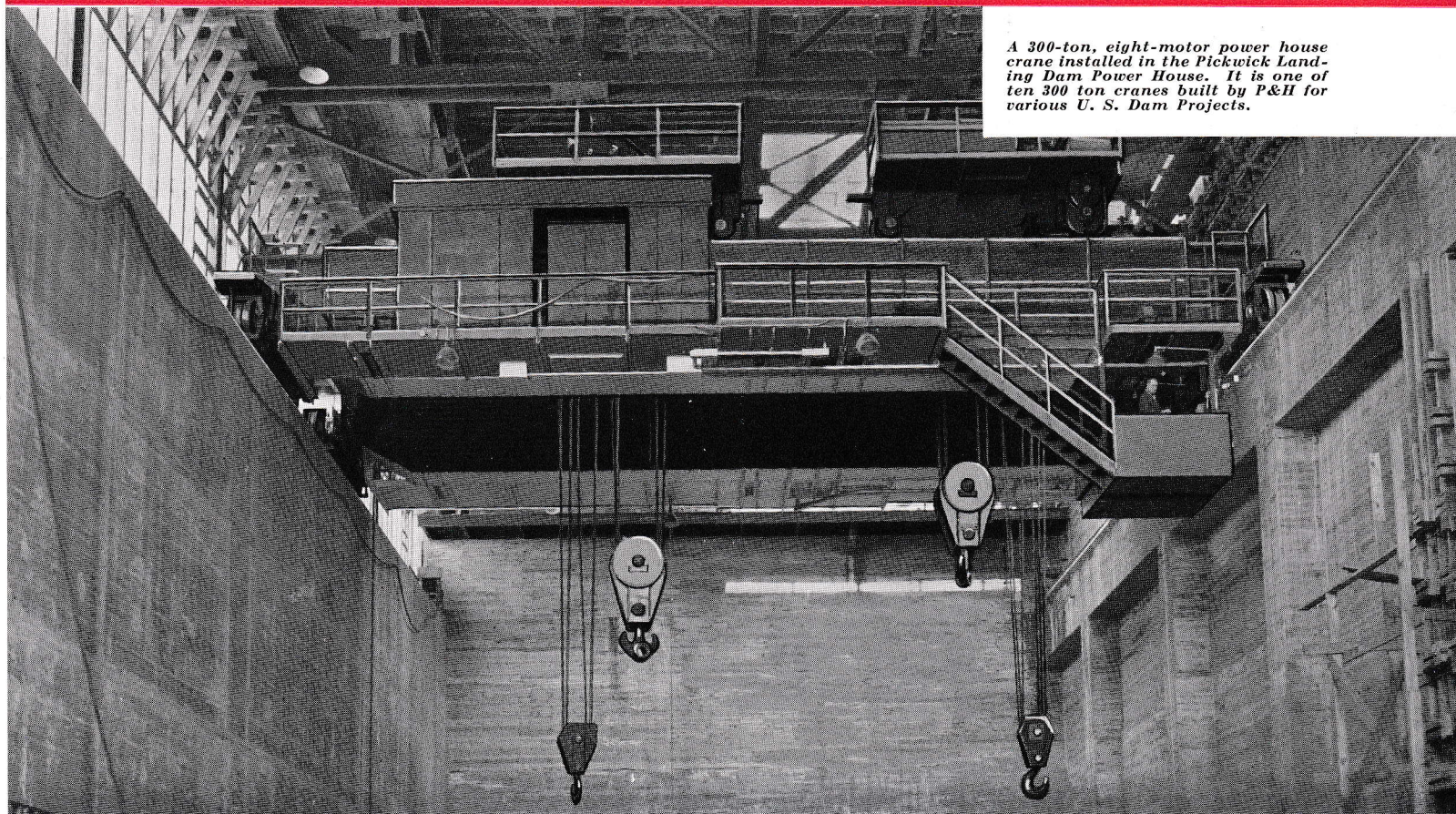


Capacity Tons	Span A	B	C	F	G	H	L	M	X	Y	Z	P	Max. Load per Each Wheel in Lbs.	Size Runway Rail Lbs. per Yd.
200 20-ton Aux.	50'	11'-6"	18"	13'-10"	3'-0"	7'-6"	9'-0"	22'-3"	3'-0"	4'-3"	14'-0"	4'-0"	60000	171
	60'	11'-6"	18"	13'-10"	3'-0"	7'-6"	9'-0"	22'-3"	3'-0"	4'-3"	14'-0"	4'-0"	68000	171
	70'	11'-9"	18"	13'-10"	3'-0"	7'-6"	9'-0"	22'-3"	3'-0"	4'-3"	14'-0"	4'-0"	74600	171
	80'	12'-0"	18"	13'-10"	3'-0"	7'-6"	9'-0"	22'-3"	3'-0"	4'-3"	14'-0"	4'-0"	81000	171
250 20-ton Aux.	50'	12'-9"	18"	14'-0"	3'-6"	7'-6"	10'-0"	25'-0"	3'-0"	4'-3"	14'-0"	4'-0"	78000	171
	60'	12'-9"	18"	14'-0"	3'-6"	7'-6"	10'-0"	25'-0"	3'-0"	4'-3"	14'-0"	4'-0"	82000	171
	70'	13'-0"	18"	14'-0"	3'-6"	7'-6"	10'-0"	25'-0"	3'-0"	4'-3"	14'-0"	4'-0"	87000	171
	80'	13'-0"	18"	14'-0"	3'-6"	7'-6"	10'-0"	25'-0"	3'-0"	4'-3"	14'-0"	4'-0"	93600	171
300 30-ton Aux.	50'	13'-0"	18"	14'-6"	3'-6"	7'-6"	10'-0"	26'-9"	3'-0"	4'-3"	14'-0"	4'-0"	92500	171
	60'	13'-0"	18"	14'-6"	3'-6"	7'-6"	10'-0"	26'-9"	3'-0"	4'-3"	14'-0"	4'-0"	98000	171
	70'	13'-6"	18"	14'-6"	3'-6"	7'-6"	10'-0"	27'-0"	3'-3"	4'-3"	14'-0"	4'-0"	103500	171
	80'	13'-9"	18"	14'-6"	3'-6"	7'-6"	10'-0"	27'-0"	3'-3"	4'-3"	14'-0"	4'-0"	109000	171

INDUSTRIAL CRANES



This 10-ton, three-motor, full roller bearing crane, has a hoisting speed of 40 f.p.m. It is equipped with alternating current motors and is used for rapid handling of sheet steel stock.

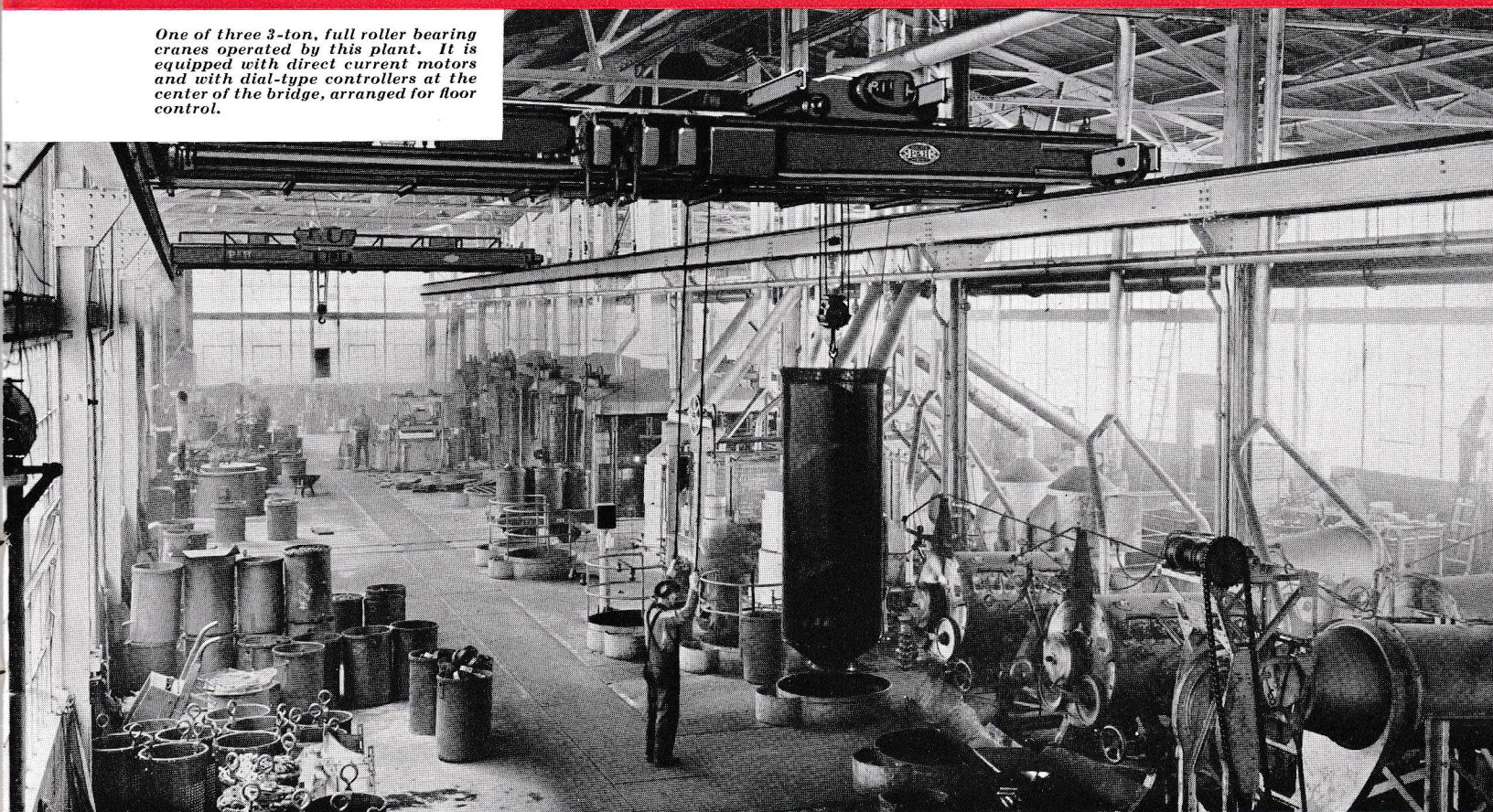


A 300-ton, eight-motor power house crane installed in the Pickwick Landing Dam Power House. It is one of ten 300 ton cranes built by P&H for various U. S. Dam Projects.

INDUSTRIAL CRANES

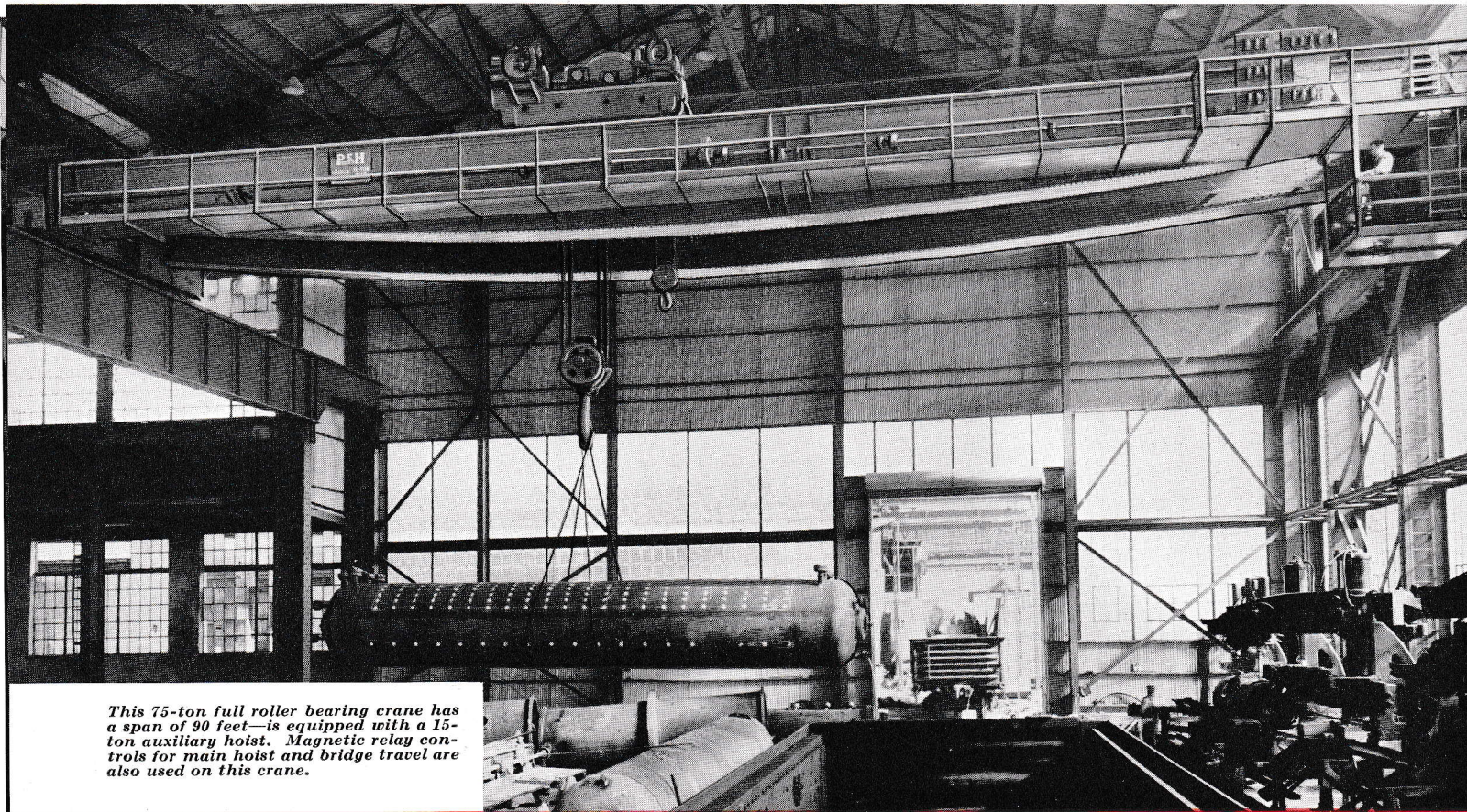


A 5-ton, three-motor, high-speed crane equipped with alternating current motors. It also has a 10 kilowatt generator set mounted on the platform to deliver direct current to a 45" lifting magnet.

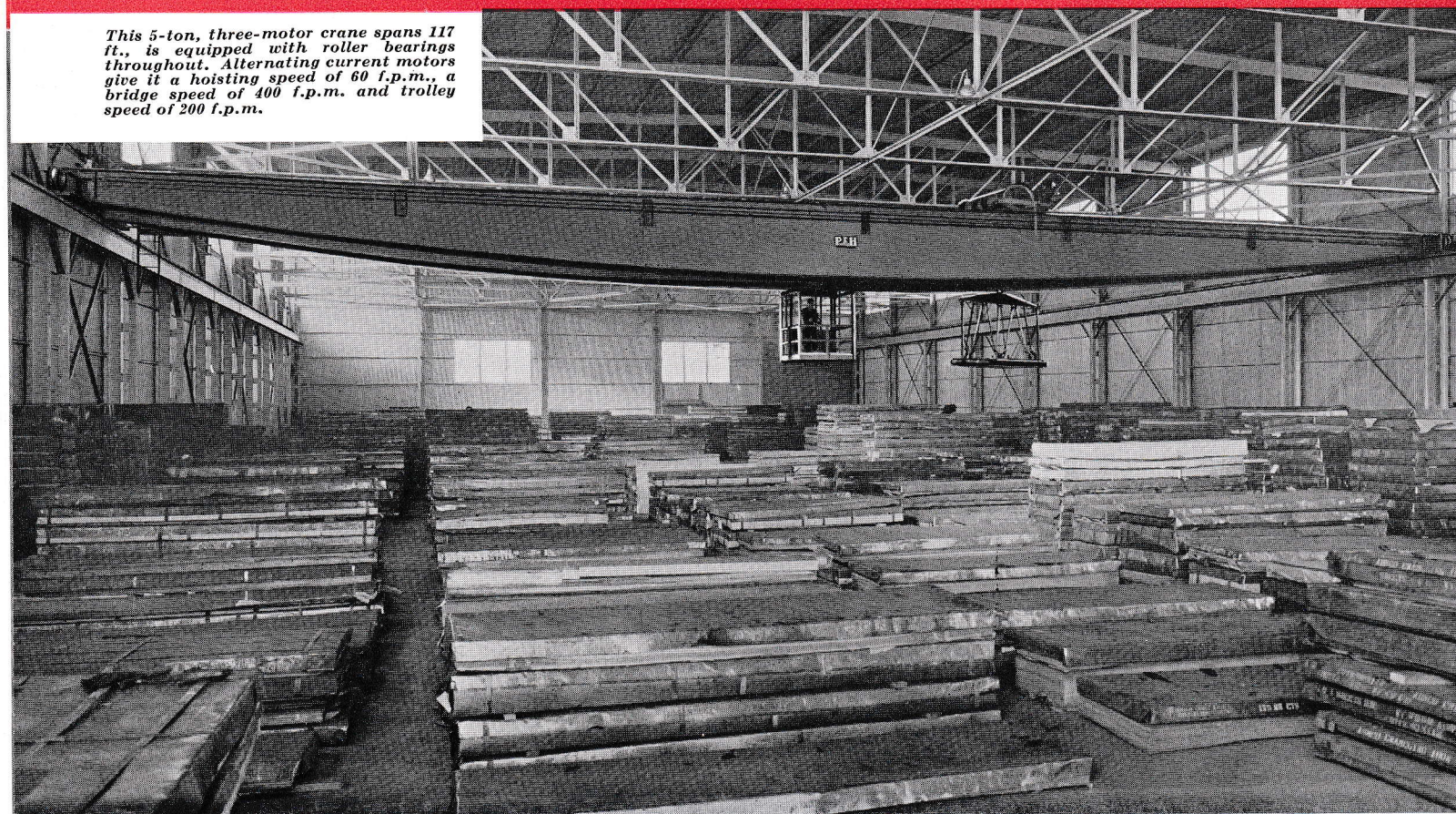


One of three 3-ton, full roller bearing cranes operated by this plant. It is equipped with direct current motors and with dial-type controllers at the center of the bridge, arranged for floor control.

INDUSTRIAL CRANES



This 75-ton full roller bearing crane has a span of 90 feet—is equipped with a 15-ton auxiliary hoist. Magnetic relay controls for main hoist and bridge travel are also used on this crane.

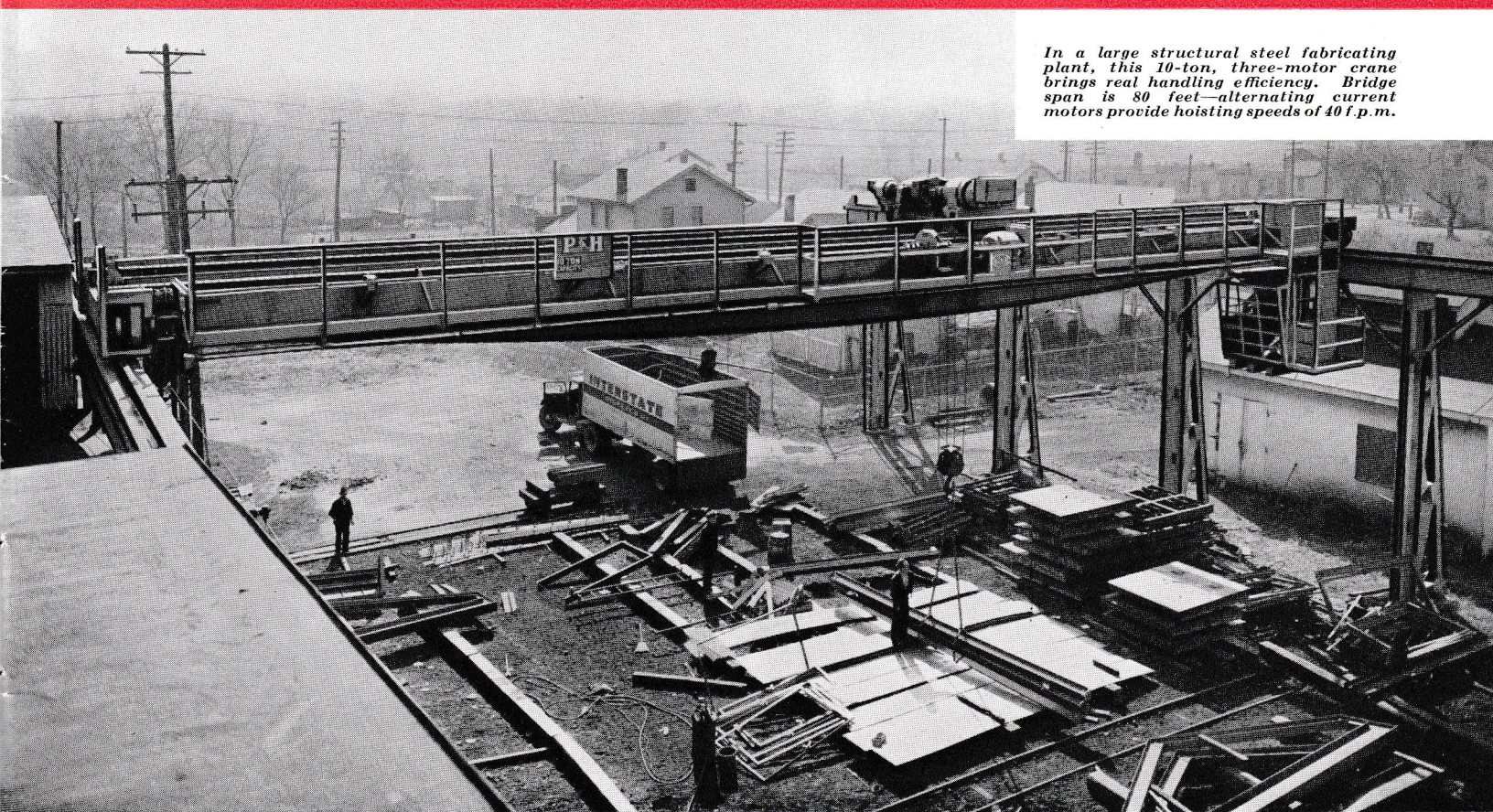


This 5-ton, three-motor crane spans 117 ft., is equipped with roller bearings throughout. Alternating current motors give it a hoisting speed of 60 f.p.m., a bridge speed of 400 f.p.m. and trolley speed of 200 f.p.m.

INDUSTRIAL CRANES

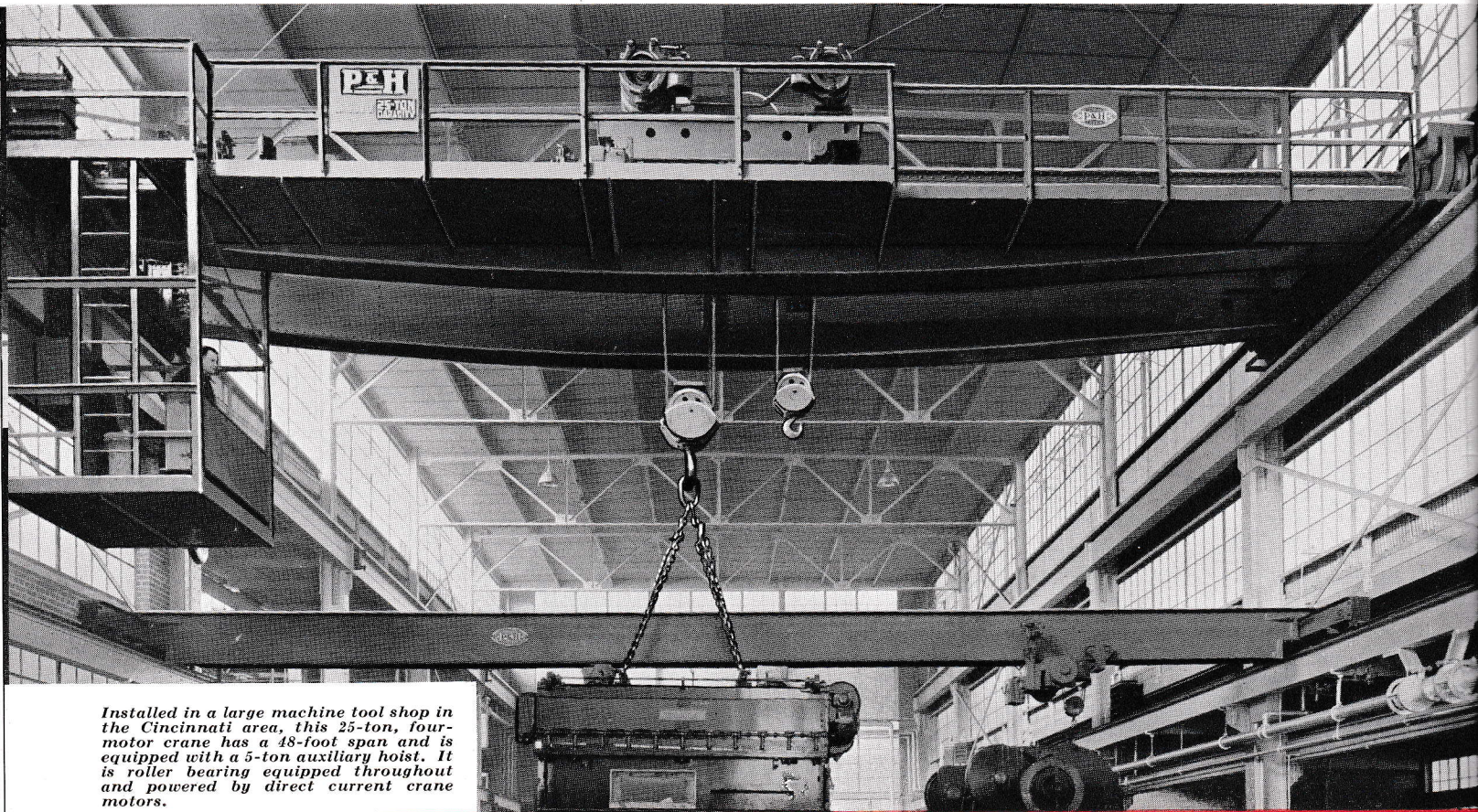


One of three 15-ton, three-motor cranes of 83-foot span, installed in a large Texas railroad shop. These cranes have hoisting speeds of 45 f.p.m.—are powered by 60 h.p. alternating current hoist motors.



In a large structural steel fabricating plant, this 10-ton, three-motor crane brings real handling efficiency. Bridge span is 80 feet—alternating current motors provide hoisting speeds of 40 f.p.m.

P&H INDUSTRIAL CRANES

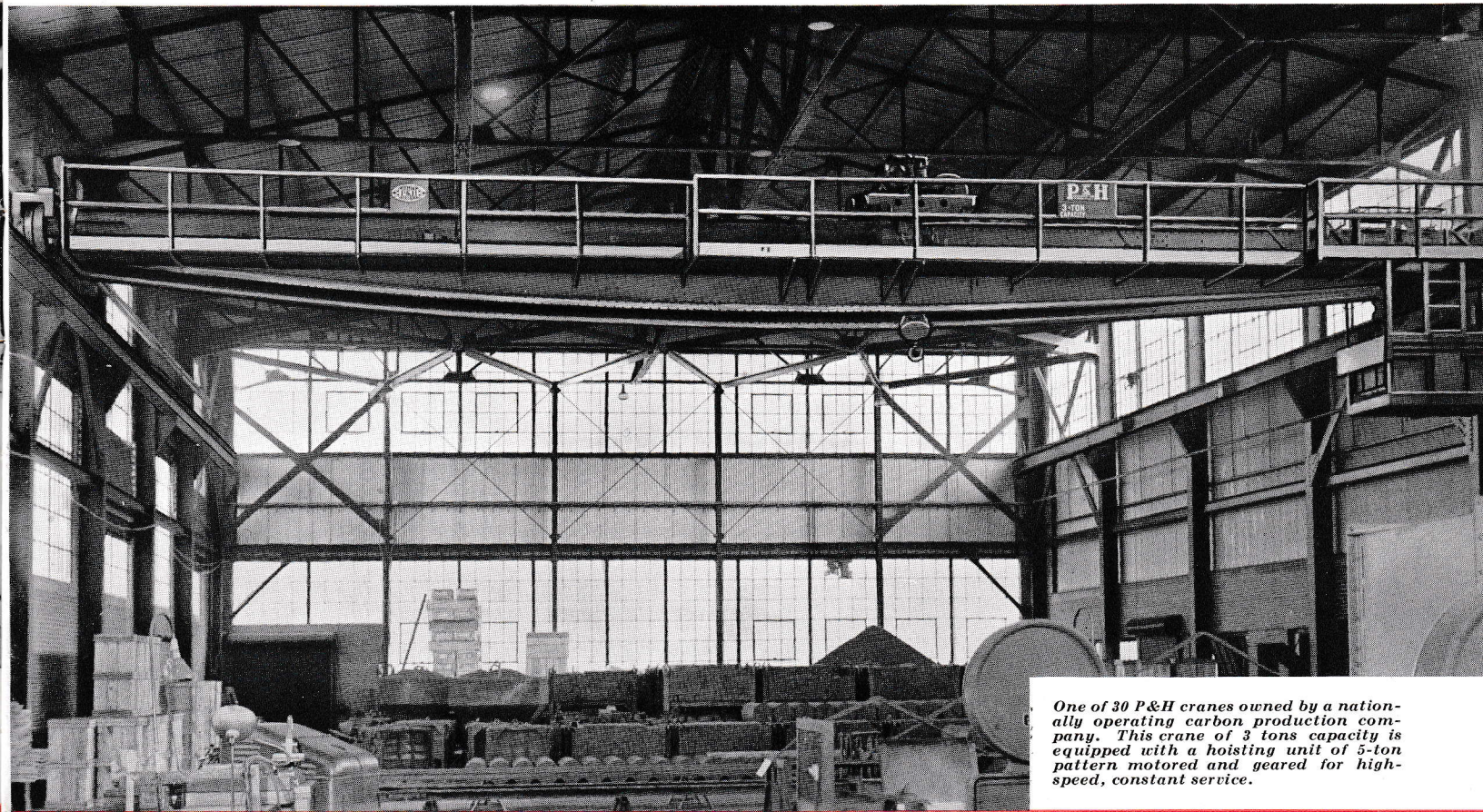


Installed in a large machine tool shop in the Cincinnati area, this 25-ton, four-motor crane has a 48-foot span and is equipped with a 5-ton auxiliary hoist. It is roller bearing equipped throughout and powered by direct current crane motors.

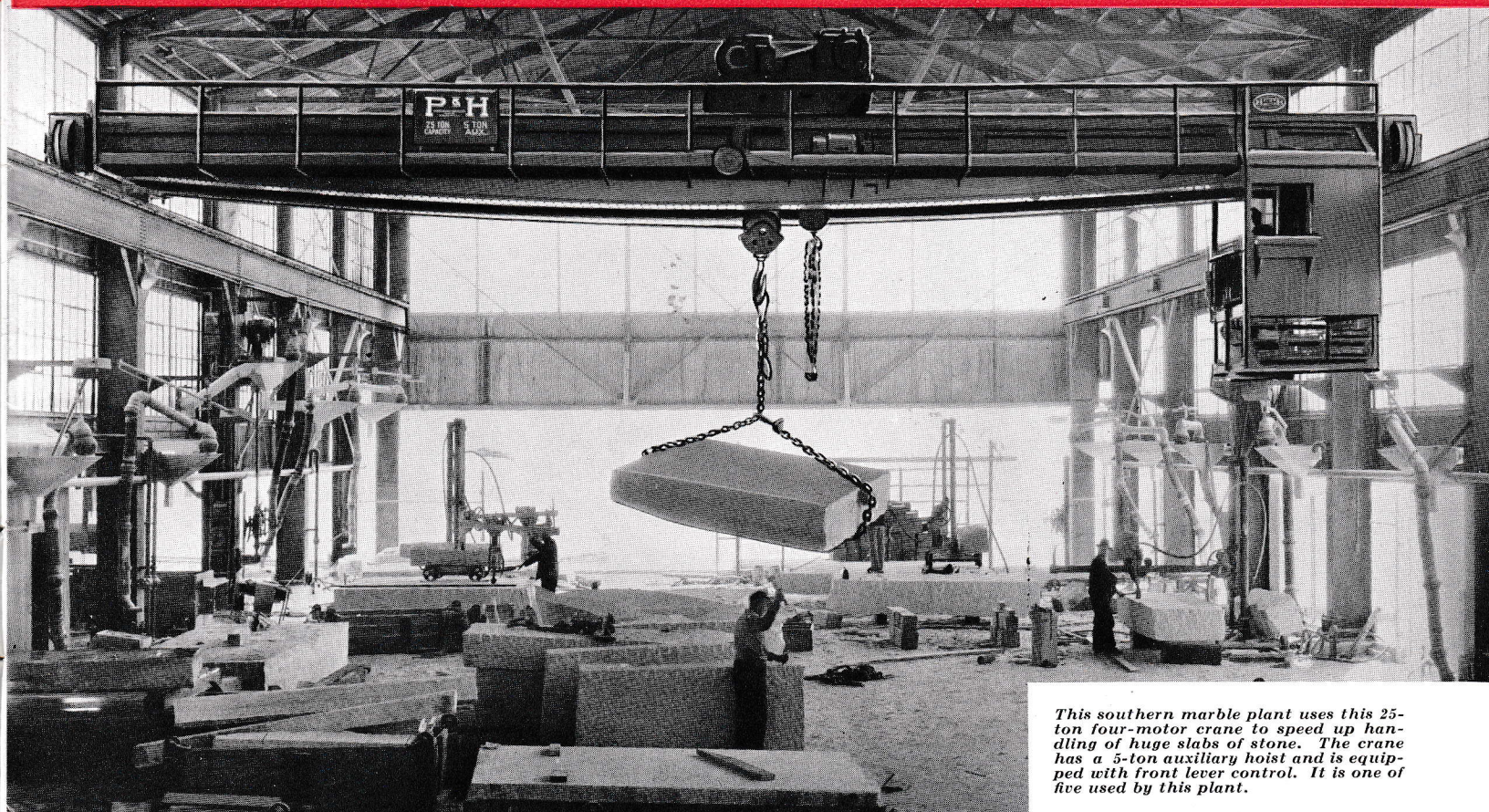


With a main hoist of 10-ton capacity and a 5-ton auxiliary hoist, this full roller bearing equipped crane is an important unit in this mill's production line. It has a 76-foot span and is equipped with alternating current motors.

INDUSTRIAL CRANES



One of 30 P&H cranes owned by a nationally operating carbon production company. This crane of 3 tons capacity is equipped with a hoisting unit of 5-ton pattern motored and geared for high-speed, constant service.



This southern marble plant uses this 25-ton four-motor crane to speed up handling of huge slabs of stone. The crane has a 5-ton auxiliary hoist and is equipped with front lever control. It is one of five used by this plant.

CRANE ACCESSORIES

LOCKHEED HYDRAULIC FOOT-OPERATED BRAKE

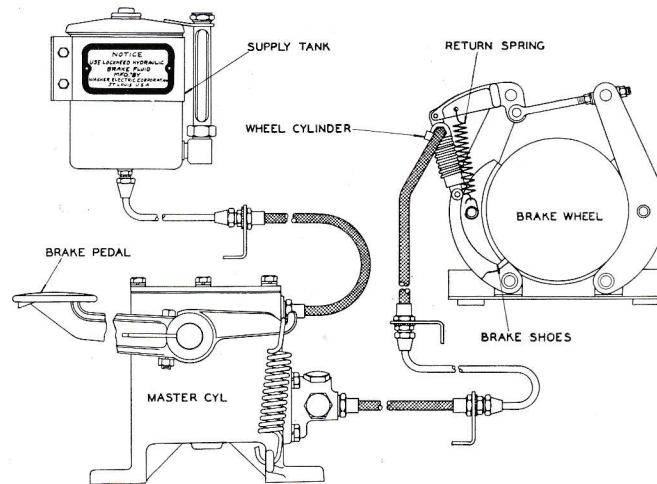


Diagram of brake system when using the Lockheed Hydraulic Foot-Operated Brake

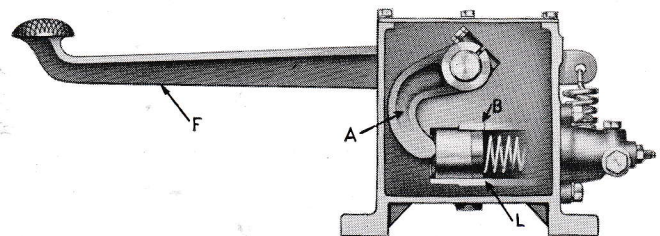
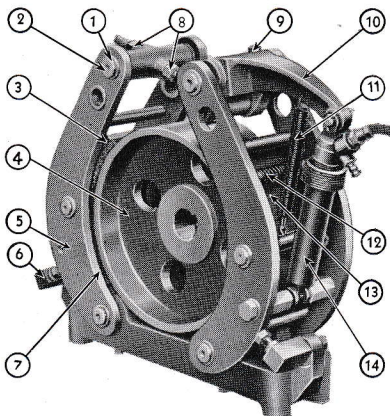
GENERAL DESCRIPTION

The Lockheed Hydraulic Brake System consists of a master cylinder in which the hydraulic pressure is originated; a wheel cylinder operating the brake shoes against the brake wheel and in which the hydraulic pressure is applied; a supply or reserve tank by which the operating fluid is maintained at a constant volume; and the "line" consisting of copper tubing, flexible hose brackets and unions interconnecting the master cylinder and wheel cylinders.

The master cylinder (L) is fitted with a piston and the wheel cylinder is fitted with an opposed piston, both of which are provided with cup packings which act as a seal to maintain pressure and prevent loss of brake fluid.

The brake pedal (F) moves the piston within the master cylinder, to force the brake fluid from the master cylinder through the copper tubing into the wheel cylinder. The piston of the wheel cylinder then moves outward and operates the brake mechanism.

When pressure on the foot pedal is released, the brake shoe returns to its normal or off position through the action of a return spring. The return movement of the brake shoes causes movement of the wheel cylinder piston towards its off position, thus forcing the working fluid back through the tubing into the master cylinder.



Box-type compensating master cylinder

P&H HYDRAULIC OPERATED BRAKE

- | | |
|--|--|
| 1—Hard bronze bushings permit closer fits. | 9—Pins locked in place with setscrew and jam nut. |
| 2—Hardened pins with liberal bearing surfaces. | 10—Short lever, short stroke, no danger of wheel cylinder pulling apart. |
| 3—Thick lining of highest grade. | 11—Long spring, no danger of over-stressing. |
| 4—Alloy cast iron wheel. | 12—Shoes are self aligning. |
| 5—Steel plate jaws welded together. | 13—Shoes easily removable for relining. |
| 6—Removable jaw stops. | 14—Wagner-Lockheed hydraulic equipment. |
| 7—Jaws overlap wheel. | |
| 8—Simple and easy adjustment for wear. | |

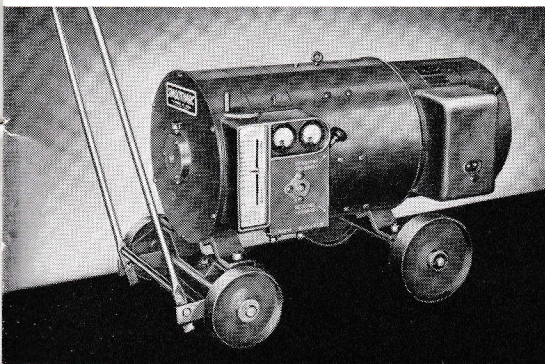
THE MOST EFFECTIVE MECHANICAL BRAKING SYSTEM KNOWN

Just as it has been used to advantage in the automobile and other industries, hydraulic controlled braking is a decided asset in all types of crane performance. Its positive action gives the operator the feel of the load at all times, allows him to spot the crane more quickly and handle heavier loads with greater safety.

P&H INDUSTRIAL EQUIPMENT AND CONSTRUCTION MACHINERY

No other crane manufacturer is so well versed in the field of material handling as the Harnischfeger Corporation—the only crane builder making a complete line of material handling equipment. This long experience in the material handling field is reflected in the line of P&H Industrial and Construction Equipment—machines that are used in every corner of the globe where dependability, economy and long service are required.

Special bulletins are prepared on all the equipment listed below—write for copies on the machines in which you are interested.

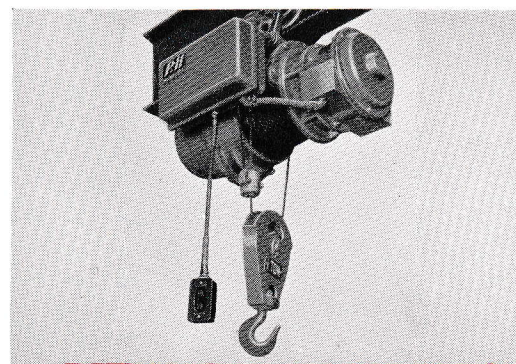


P & H - HANSEN ELECTRIC WELDERS

With patented single current control and internal stabilization, P&H - Hansen welders bring new ease to all repair, maintenance and fabrication welding jobs. They are built in a complete range of sizes from 75 to 600 amperes and are available on several types of mountings for shop or field duty.

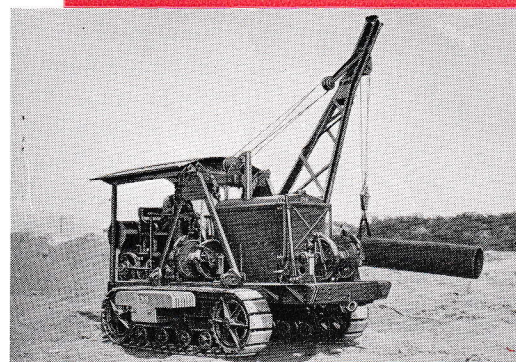
P & H HOISTS

Used in every industry for lifting, lowering and moving loads weighing up to 15 tons, P&H Hoists are available for jib, hook, bolt or trolley suspension, to use with A.C. or D.C. current. With patented push-button control they pay for themselves in a short time by cutting the "lift time" in any material handling operation.



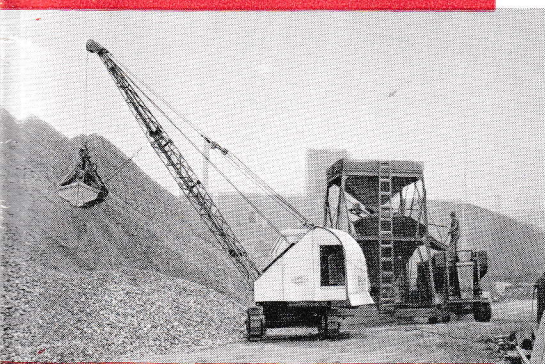
P & H TRUCK CRANE

Designed for use with standard truck chassis, P&H Truck Cranes answer the need for highly mobile units to aid in structural steel erection and many other types of crane service — and, as a clamshell, for general building materials handling and light-duty excavating work. In town or country, their fast job to job transportation enables them to economically meet the high speed requirements of today.



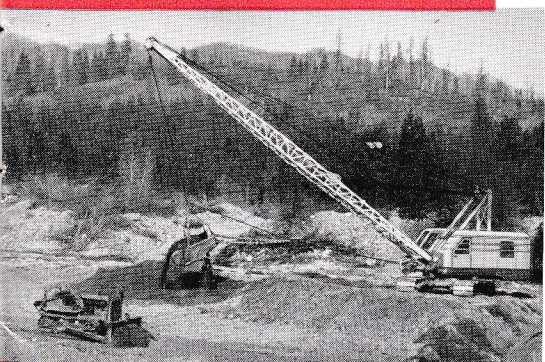
P & H MULTI-SERVICE CRAWLER HOIST

This multiple-purpose machine combines unusually high lifting capacity with the draw bar pull and mobility of a tractor. It is easily adaptable for use as a general duty tractor, pipe handler, earth borer, car switcher, power drag scraper, etc. With a ground pressure of only 7.6 lbs. per square inch, it maneuvers easily to perform many tasks that would otherwise require several machines.



P & H EXCAVATORS

Known as P&H "Pacemakers" these husky crawler-mounted material movers are available in every standard capacity from $\frac{3}{8}$ to 5 cubic yards with Diesel, gasoline or electric power. On all sizes where applications are practical the machines are designed for easy conversion for six types of service.



P & H P A R T I A L L I S T O F

BELOW YOU WILL FIND A FEW OWNERS OF SOME OF THE

User	No. of Cranes
Anaconda Copper Mining Co. (Various Plants).....	325
Bethlehem Steel Co. (Various Plants).....	317
Allis-Chalmers Mfg. Co., West Allis, Wis.....	309
General Motors Corp. (Various Plants).....	196
American Smelting & Refining Co. (Various Plants)	149
United States Government.....	122
Carnegie-Ill. Steel Co., Chicago, Ill. (Various Mills)	122
Ford Motor Co., Detroit, Mich.....	108
Baldwin Locomotive Works, Philadelphia, Pa.....	104
Standard Steel Works Co., Burnham, Pa.....	97
Weyerhaeuser Timber Corp., and Subsidiaries.....	96
International Harvester Co., Chicago, Ill.....	92
A. O. Smith Corp., Milwaukee, Wis.....	85
The Midvale Steel Co., Philadelphia, Pa.....	82
Bucyrus-Erie Co. (Various Plants).....	71
The Pullman Co., Chicago, Ill.....	69
American Brown Boveri Co., Camden, N. J.....	66
American Locomotive Co. (Various Plants).....	63
Crucible Steel Co. of America, Pittsburgh, Pa.....	58
Ingersoll-Rand Co. (Various Plants).....	57
American Car and Foundry Co. (Various Plants).....	57
Inland Steel Co., Indiana Harbor, Ind.....	57
American Bridge Co., Ambridge, Pa.....	55
Pennsylvania Railroad Co., Philadelphia, Pa.....	52
Long Bell Lumber Co., Longview, Wash.....	51
Union Carbide Co.....	48
National Carbon Co. (Various Plants).....	47
U. S. Cast Iron Pipe Co., Burlington, N. J.....	44
J. I. Case Threshing Machine Co., Racine, Wis.....	43
Chicago & Northwestern R. R., Chicago, Ill.....	41
Sullivan Machinery Co., Chicago, Ill.....	41
The Falk Corporation, Milwaukee, Wis.....	40
Worthington Pump & Mchy. Corp. (Various Plants).....	39
New Orleans Board of Port Comm., New Orleans, La.....	37
Oil Well Supply Co., Pittsburgh, Pa.....	37
Caterpillar Tractor Co., Peoria, Ill.....	36
Jos. T. Ryerson & Son, Chicago, Ill.....	36
Dodge Brothers, Detroit, Mich.....	35
Milwaukee Elec. Ry. & Light Co., Milwaukee, Wis.....	35
Pacific Lumber Co., Scotia, Calif.....	33
The Nat'l. Malleable Castings Co. (Various Plants).....	33
Crane Company, (Various Plants).....	33
Bettendorf Co., Bettendorf, Iowa.....	31
Calumet & Hecla Cons. Mining Co., Calumet, Mich.....	31
Pittsburgh Plate Glass Co. (Various Plants).....	30
Amer. Manganese Steel Corp., Chicago Hgts., Ill.....	29
Sun Shipbuilding Co., Chester, Pa.....	29
Truscon Steel Co., Youngstown, Ohio.....	29
Edw. Ford Plate Glass Co., Rossford, Ohio.....	29
Nordberg Mfg. Co., Milwaukee, Wis.....	28
Phelps Dodge Corp., Douglas, Arizona.....	28
Fairbanks, Morse & Co. (Various Plants).....	27
Reading Iron Co., Reading, Pa.....	26

P & H CRANE USERS

FIRST 10,000 P&H ELECTRIC CRANES PUT IN SERVICE

User	No. of Cranes
Superior Steel Corp., Carnegie, Pa.....	25
Southern Ry., Washington, D. C. (Various Plants).....	25
Weirton Steel Co., Weirton, W. Va.....	25
Vermont Marble Co., Proctor, Vt.....	25
Chicago, Milwaukee & St. Paul, (Various Plants).....	25
Chain Belt Co., Milwaukee, Wis.....	25
Pettibone Mulliken Co., Chicago, Ill.....	24
Studebaker Corp., South Bend, Ind.....	24
Henry Vogt Machine Co., Louisville, Ky.....	24
Harris Structural Steel Co. (Various Plants).....	24
Jeffrey Mfg. Co., Columbus, Ohio.....	24
Wheeling Steel Corp., Wheeling, W. Va.....	23
Goodman Manufacturing Co., Chicago, Ill.....	22
The Vilter Mfg. Co., Milwaukee, Wis.....	21
Globe Steel Tubes Co., Milwaukee, Wis.....	21
Kohler Co., Kohler, Wis.....	20
Standard Sanitary Corp., (Various Plants).....	20
The Atchison, Topeka & Santa Fe R. R. Co.....	20
C. F. Braun Co., Alhambra, Calif.....	20
Otis Elevator Co. (Various Plants).....	20
Ingersoll Milling Mach. Co., Rockford, Ill.....	20
Lukens Iron & Steel Co., Coatsville, Pa.....	19
Chicago, Burlington & Quincy R. R., Chicago, Ill.....	19
Bullard Machine Tool Co., Bridgeport, Conn.....	18
Follansbee Bros. Co., Follansbee, W. Va.....	17
Fulton Iron Works, St. Louis, Mo.....	17
New Jersey Zinc Co., Franklin Jct., N. J.....	17
Toledo Machine & Tool Co., Toledo, Ohio.....	17
Tremont Lumber Co., Rochelle, La.....	16
Belmont Iron Works, Philadelphia, Pa.....	16
National Plate Glass Co., Ottawa, Ill.....	16
Gould Coupler Co., Depew, N. Y.....	16
Consolidated Mining & Smelting Co., Trail, B. C.....	16
Chase Companies, Waterbury, Conn.....	16
Mesta Machine Co., Homestead, Pa.....	16
Norton Grinding Co., Worcester, Mass.....	16
Simmons Co., Kenosha, Wis.....	15
The Filer & Stowell Co., Milwaukee, Wis.....	14
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Gulf States Steel Co., Birmingham, Ala.....	14
Andes Copper Co., Potrerillos, Chile, S. A.....	13
Washington Pulp & Paper Co., Port Angeles, Wash.....	13
American Cyanamid Co., Warner, N. J.....	13
Standard Oil Co. (Various Plants).....	13
Shoemaker-Satterthwaite Bridge Co., Pottstown, Pa.....	12
United Verde Copper Co. (Various Plants).....	12
Heppenstall Forge Co., Pittsburgh, Pa.....	12
Heil Co., Milwaukee, Wis.....	12
Ft. Pitt Bridge Works, Cannonsburg, Pa.....	12
Mississippi Valley Struct. Steel Co. (Various Plants).....	12
John Eichleay, Jr. Co., Pittsburgh, Pa.....	11
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Firestone Tire & Rubber Co., Akron, Ohio.....	10
Gisholt Machine Co., Madison, Wis.....	10



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